Welding Engineer

PRICE 50 CENTS

JUNE, 1956

Among new arc welding equipment, Jackson's fiber glass helmet with its all-nylon Adjust-O-Lok headgear is the center of attention. It combines the qualities of two great modern materials for safe, long lasting protection.

JACKSON
PRODUCTS, INC.
WARREN - MICHIGAN

JACKSON ARC WELDING ACCESSORIES AND SAFETY EQUIPMENT ARE SOLD WORLD-WIDE BY DISTRIBUTORS AND DEALERS

The BEST PROTECTION means MORE PRODUCTION

. . . experience proves that for comfort and protection

FIBRE-METAL *Designs Best*

OVER 30 TYPES TO MEET ALL YOUR NEEDS!

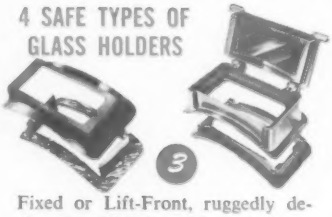
1 SEAMLESS MOLDED FIBERGLAS SHELLS

Compression-molded of Fiberglas-reinforced superior thermo-setting polyester resin, Fibre-Metal Helmets, *self-extinguishing* and with strengthening beaded edging, are the natural result of over 50 years of specialized experience. They are rugged, impervious to moisture, will not warp and are of light weight. They resist heat, abuse, and are easily cleaned and sterilized.

COMFORT! FREE-FLOATING QUICK-ADJUST HEADGEAR 2

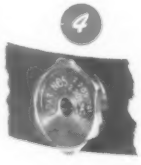
One size fits all head sizes! Free-floating principle . . . avoids pressure at temples and forehead. Allows comfortable shaping of headband to head! Special riveting prevents hair pulling.

4 SAFE TYPES OF GLASS HOLDERS 3



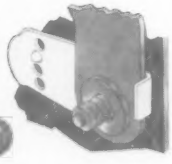
Fixed or Lift-Front, ruggedly designed and fabricated in Bakelite or Insulated Dowmetal. Light, durable. Metal holders are safe, insulated. Glasses easily inserted or removed.

CONVENIENCE! WIDE RANGE QUICK RATCHET HEADSIZE ADJUSTMENT 4



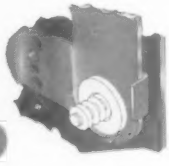
Revolutionary, light, durable material with entire mechanism enclosed in fibre tube insulating it from head of wearer. Right or left turning to adjust size . . . remains positive.

4-POSITION ADJUSTABLE HELMET STOP 5



Positions helmet for overhead and vertical welding. Positive stop, easily adjustable to any of 4 positions without tools. Allows normal raising of helmet on friction joints.

LONG-LASTING FRICTION JOINTS 6



A variety of designs for all purposes, allowing easy, outside adjustment with no plastic parts to break. A slight nod brings Helmet to operating position.

REPLACEABLE SWEATBANDS 7

Snap buttoned

The supreme comfort of Genuine Leather (also in Simulated Leather). Smooth overlap construction, no annoying wrinkles, felt padded.

CHIN REST 8 A real comfort feature always . . . and particularly for overhead welding!

Write for Catalog 24 and Bulletin 39 . . . cataloguing the best in working protection!

THE WORLD'S LARGEST MANUFACTURER OF SUPERIOR PROTECTIVE EQUIPMENT

Sold Everywhere thru Leading Distributors and Dealers

The FIBRE-METAL Products Company | CHESTER PENNA.

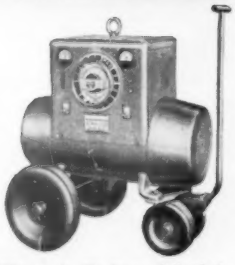
WELDING HELMETS • SPEEDY ATTACHMENTS • SUPERGARD HATS & CAPS • INSULATED EUREKA HOLDER • FACE SHIELDS • WELD CLEANING HAMMERS • FRESHAIR SYSTEMS

EXTRA advantages in HOBART arc welders

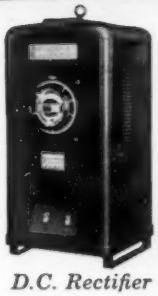
let you do *faster* welding at lower cost

The neatest package of welding energy you ever saw...→ the "Husky Boy." It welds anywhere!

electric **gas drive**

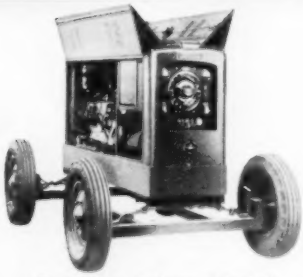


Electric Driven Models



D.C. Rectifier

A Hobart Electric Driven Welder is QUALITY ready for action—it will give you broad welding ranges, faster and smoother welds. Over 25 built-in "extras" in each Hobart add up to years of trouble-free, top performance welding that lets you make money every step of the way. Choose from Hobart's complete line. Select the one that best suits your work, whether it calls for production, maintenance, or repair.



Gasoline Driven Models

You can depend on every Hobart Gasoline Engine Driven Welder's performance—especially where time determines your costs. That's where a Hobart becomes your most valuable tool. Hobart convenience features speed up work and cut costs by simplifying your operation. Mail the coupon below for complete details on the type of welder that most interests you. HOBART BROTHERS CO., BOX U-66, Troy, Ohio, Ph. 21223.

HOBART *"One of the world's largest builders of arc welding equipment"*

HOBART WELDERS • ELECTRODES

for every welding job there's a dependable **HOBART electrode.** Send for samples today!

Hobart
products known and depended upon throughout the world

Electric Motor Drive • Gas Engine Drive • Engine Drive with Auxiliary Power • D.C. Rectifiers • A.C. Transformers • A.C. Power–A.C. Welder Combination • D.C. Generator Only for Belting • A.C. Power–A.C. Welder Combination Generator Only for Belting • Fully Automatic Submerged Arc • Semi-automatic Welding Gas Migarc • Semi-automatic Submerged Arc • Self Propelled Gas Engine Drive • Carbonair Cutting and Gouging

HOBART BROTHERS COMPANY,
BOX U-66, TROY, OHIO

Without obligation, please send me complete details on the type of welder I've indicated:

_____

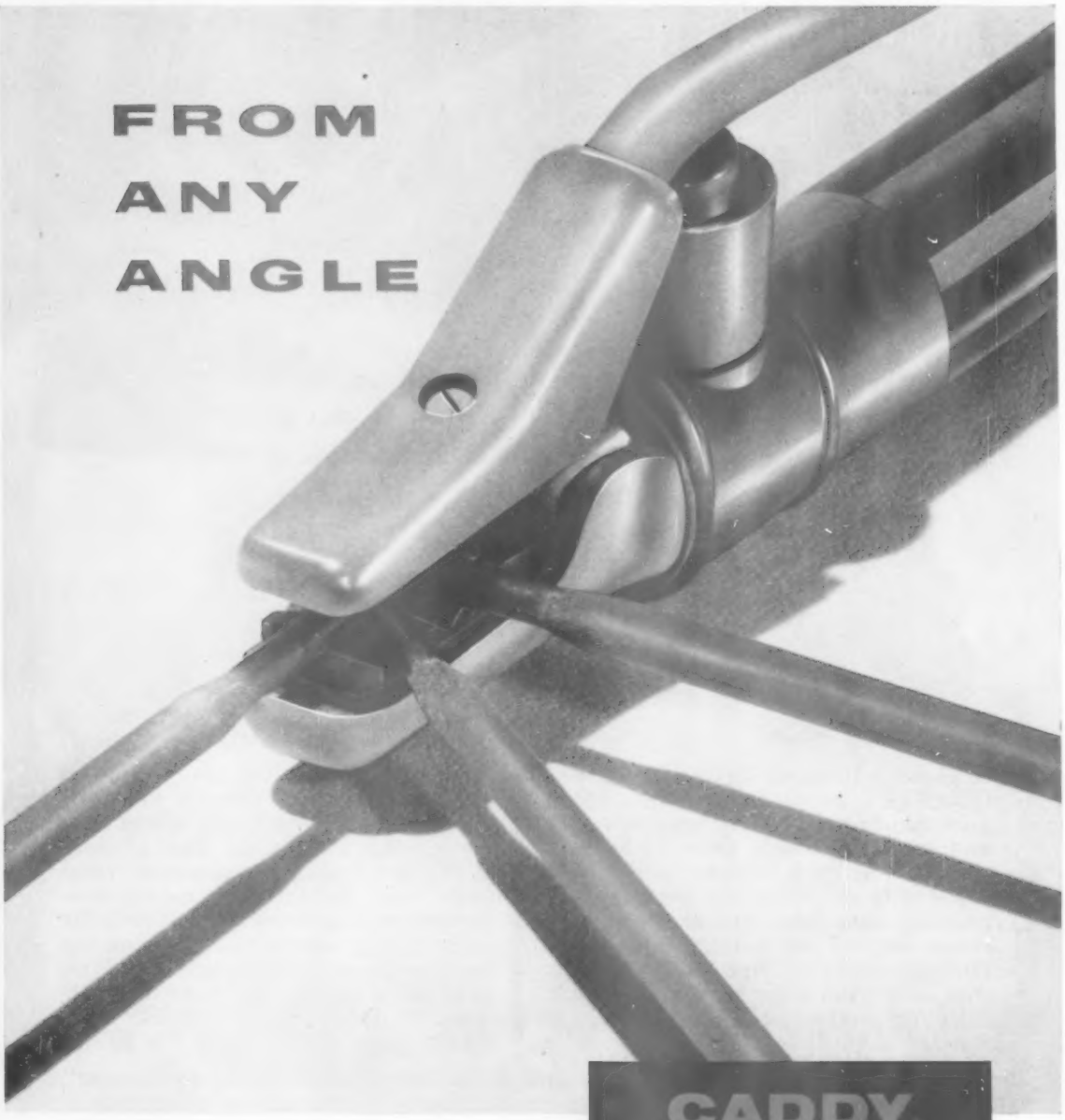
_____ (*Amp. Capacity*)

Name _____

Address _____

City _____ *State* _____

BEST



CADDY®

ARC WELDING ACCESSORY DIV.

Erico Products, Inc.

2070 E. 61st Place • Cleveland 3, Ohio

IN CANADA: ERICO INCORPORATED, 3571 Dundas St., West, Toronto 9, Ontario

CADDY
TYPE B
ELECTRODE
HOLDERS

Write for FREE 1956 catalog today

Welding Engineer

JUNE, 1956
VOL. 41—No. 6

THE MAGAZINE OF JOINING
AND SEVERING OF MATERIALS

America's pioneer publication which, combined with The Acetylene Journal, has been devoted to the interest of the welding and allied industries since 1878

Copyright 1956 by
WELDING ENGINEER PUBLICATIONS, INC.
12 East Grand Avenue
Chicago 11, Illinois
Telephone: DElaware 7-0339

TED B. JEFFERSON
Editor and Publisher

FELIX T. TANCULA
Executive Editor

JACK FAIRLIE
Associate Editor
AUDREY L. MADSEN
Assistant Editor
B. M. BRITE
Editorial Assistant

PATRICE L. SIMPSON, *Production*

JIM BREWSTER, *Circulation*

WARREN WARE
Western District Manager
12 E. Grand Ave., Chicago 11, Ill.
Telephone: DElaware 7-0339

HERMAN PHELPS
Eastern District Manager
P. O. Box 128, White Plains, N. Y.
Telephone: WHite Plains 9-3876

MEMBER
American Welding Society
International Acetylene Association
Compressed Gas Association
National Welding Supply Association
Audit Bureau of Circulations

Single copies 50 cents. Subscription rates: United States and possessions $3 per year; $4 for two years; $5 for three years. Canada $5 per year; $8 for two years; $10 for three years. All other countries $15 per year; $25 for two years; $30 for three years. Position and company affiliation must be indicated on subscription form. Allow one month for change of address.

Published monthly, with an additional directory number in June, by Welding Engineer Publications, Inc.

Entered as second class matter Aug. 23, 1948, at the Post Office at Chicago, Ill., under Act of March 3, 1879. Printed in U. S. A.

WELDING ENGINEER is indexed regularly by Engineering Index, Inc.

FABRICATION

Flame processes fabricate and protect oil well drill bits 30
W. B. Noble

No-carbon paint aids production welding 48
M. R. Gavin

Automatic Mig joins 5-in. cast rolls 54
Automated brazing forms rifle grenades 56
Howard E. Jackson

MAINTENANCE

Braze-welding repairs a badly damaged steel mill engine 27
R. L. Rectenwald

CONVENTION

AWS: New equipment, new information, new records! 37

OPERATION

No more "dogs" 29
Welding shows adaptability in rocket fabrication 32
Francis H. Stevenson

That big step from manual to automatic flame-cutting 35
Stringing oil pipe is a mile-a-day welding job 58
A. G. Barkow

RESEARCH

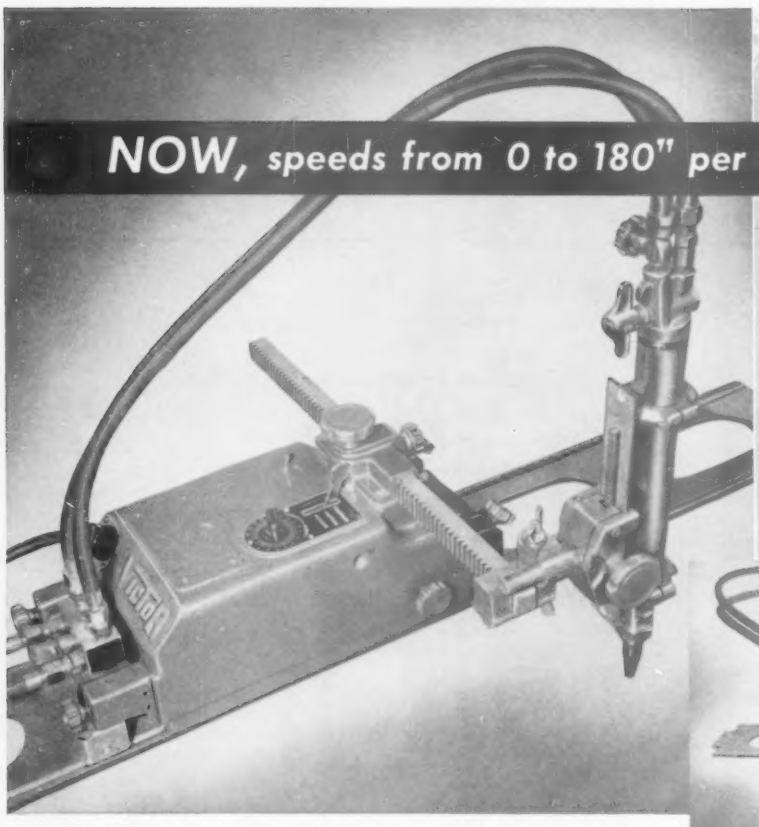
Uses expand as 200-series stainless passes weldability tests 40

DEPARTMENTS

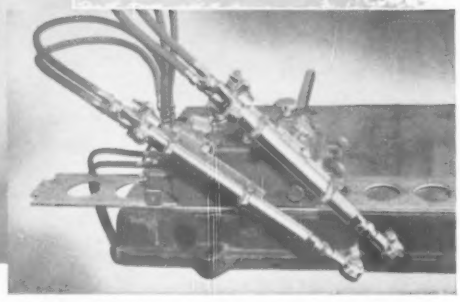
News 5
Your WeldWorld at press time 15
Letters to the editor 19
Editorial: A start in the right direction 25
Data Sheet No. 189: Physical properties of 200-series stainless 41
The welding clinic: Returns on equipment investments 52
New Products 64
People 83
Book reviews 86
30 years ago 87
Free literature 88
Where to buy 88
The Welding Shopper 89
Advertisers in this issue 90
Literature offered in ads 90
Welding Info-Aids 91

NOW, speeds from 0 to 180" per minute with new

VICTOR
PORTABLE
Flame-cutting Machine
MODEL VU-120



Model VU-120 weighs only 35 lbs. Main wheels run on ball bearings; casters swivel on ball bearings, run on oilite bearings, are shrouded as protection against slag.



Torches on Model VU-120 easily angled for bevel cuts. Machine accommodates both 2 or 3-hose torches, and in certain set-ups each holder can handle multiple torches.

Operates at same speeds forward or reverse.
Cuts straight lines, circles, square or bevel kerfs.
Adaptable to many automatic welding applications.

Now constant running motor and 3-position torque-converter transmission of new Model VU-120 bring you speeds from 0 to 180" per minute—forward and reverse—without loss of power at low speeds. In neutral position, machine free wheels so you can set up easily and quickly. Wide speed range enables you to adapt travel carriage to many automatic welding applications, using either submerged or inert arc.

You get remarkable accuracy from the Model VU-120. Floating rear caster practically eliminates side tilt and wobble. There's no "creeping"—shut off machine and it stops instantly.

Universal torch holder accommodates any model VICTOR machine cutting torch, with or without gear rack. Two torch holders can be used if desired. Case is pre-drilled for extra torch holder, side guide roller, or counterweight.

Try the fast-operating VU-120. Ask your VICTOR dealer for a demonstration on your job NOW . . . or write us for descriptive Bulletin 353.

VICTOR for welding

For maximum efficiency and safety, use genuine Victor tips and parts

VICTOR EQUIPMENT COMPANY

Mfrs. of welding & cutting equipment; hardfacing rods, blasting nozzles; cobalt & tungsten castings; straightline and shape cutting machines.

31

844 Folsom St., San Francisco 7 • 3821 Santa Fe Avenue, Los Angeles 58

A GROUP of welding distributors who attended recent sales seminar in Milwaukee. (See story below.)

RECOGNIZED for welding contributions, Russell Meredith holds bronze plaque awarded by Los Angeles Section, American Welding Society. (See story below.)

News

Ampco holds sales seminar

Ampco Metal, Inc., Milwaukee, was host during the week of April 9 to its welding distributors. The distributors visited the firm's Milwaukee plant for the 1956 sales seminar.

The seminar, lasting two days, was presented twice during the week, allowing smaller, more informal discussions. An important topic of discussion was the role of the distributor in resale of products.

The distributors were welcomed to Ampco by J. P. Henry, general sales manager, who then turned the program over to F. E. Garriott, manager of the Weldrod Department.

A plant tour and demonstration of welding techniques, conducted by H. H. Hose and W. E. Claflin, highlighted the conference. Upon completion of the seminar each distributor received a "diploma," conferring the title of "Ampco Welding Specialist."

Mansol ceramics opens new division

Mansol Ceramics Co., Belleville, N. J., has established a new division for production of silver brazing preforms. In additions to regular production, facilities are available for solution of special problems. All special formulas will be subjected to extensive tests (as are standard formulas) and to special standards set by the customer. Mansol also manufactures glass multiforms and an epoxy resin preform for metal to metal, metal to nonmetal and nonmetal to nonmetal sealing. *(See new products section.)*

Liquid Carbonic acquires Western Oxygen, Inc.

The Liquid Carbonic Corp., Chicago, has acquired Western Oxygen, Inc., Seattle, Wash., producer of oxygen, acetylene and medical gases. Western Oxygen is also a distributor of welding equipment and supplies.

Expansion move by Stulz-Sickles Co.

Currrently under construction is a new, modern plant, warehouse and office for Stulz-Sickles, Co., Newark, N. J. The new building will be erected on a two-acre tract in North Elizabeth, N. J.

All operations now carried on at the Newark plant will be transferred to the new location, upon completion of the building, scheduled for September of this year.

Airline Welding builds new plant

Airline Welding & Engineering, Hawthorne, Calif., has begun construction of a new building, situated on five acres of industrial property in Los Angeles.

Meredith receives AWS award

In recognition of his achievements and contributions to welding Russell Meredith was recently presented a bronze plaque by the Los Angeles Section of the American Welding Society. This award marks the second scientific citation accorded him in the past nine years. In 1947 Mr. Meredith received the James F. Lincoln Arc Welding Foundation Certificate of Award.

Mr. Meredith, supervisor in the Materials Research and Process Development Group of the Missile Development Division, North American Aviation, Inc., Los Angeles, holds a number of patents on welding processes.

Federal Machine plans expansion

The Federal Machine & Welder Co., Warren, Ohio, will spend approximately $750,000 next year for expansion of its production facilities. The bulk of the expenditure will go to new machinery, with some increase in floor space for certain departments.

Jersey Welding acquires Brunswick Oxygen Co.

Jersey Welding Supply, Inc., Plainfield, N. J., has acquired Brunswick Oxygen Co., New Brunswick, N. J. Brunswick will continue to operate under the same name.

Robert V. Thornton, formerly of Metal & Thermit Corp., will be sales manager for both firms. Larson H. McClintock and John Murphy have joined the sales force of Brunswick Oxygen Co.

News

from page 5

ENLARGED facilities provided by new plant of solder manufacturer makes available engineering research and development service. (See story below.)

CREW of the U. S. S. Glacier, big icebreaker on Operation Deepfreeze, unloads a tractor onto shore ice at Little America in the Antarctic. (See story below.)

Fusion Engineering builds new plant

Construction of a new plant by Fusion Engineering, East Cleveland, Ohio, has enlarged facilities, at the firm's present location, 17921 Roseland Ave. The new plant will provide engineering, research and development service. The firm manufactures paste solders and brazing alloys.

Unique Turntable changes name

Unique Turntable & Equipment Corp., Brooklyn, N. Y., has changed its name to Unique Equipment, Inc.

American Welding opens new plant

American Welding & Mfg. Co., Warren, Ohio, recently opened its new facilities in Niles, Ohio. Full production has begun in the plant, purchased from Standard Boiler & Plate Iron Co.

Manufacture will include building products (swinging, sliding and folding steel doors) earlier produced at the Warren plant. N. E. Lewis has been named Niles plant superintendent.

Distributor group to meet in San Diego

The annual meeting of the Independent Welding Distributors Association, Inc., will be held June 21 and 22 in San Diego. New business for the coming year will be discussed, with election of officers planned. Hosts for the meeting will be Bailey Equipment Co. and Pacific Acetylene Co., both of San Diego.

Capital Welding in new building

Capital Welding Supply Co. has moved into its new building at 1101 North St., Little Rock, Ark. The new structure provides 5,000 sq ft of floor space for Capital, a supplier of welding equipment and supplies. H. R. Shannon is president of the firm.

Federated opens solder facility

A core-solder manufacturing facility has been established at the San Francisco plant of Federal Metals Division of American Smelting & Refining Co., New York City. It will manufacture all compositions of the firm's plain and activated rosin core solders and acid core solders. The new facility is reported to incorporate latest developments in solder-making technology.

Bellows consolidates West Coast offices

All West Coast activities of the Bellows Co., Akron, Ohio, have been consolidated in a new building at 926 Western Ave., Glendale, Calif. The new structure will serve as headquarters both for the Bellows Co. of California and the Smith Johnson manufacturing division. The Bellows Co. manufactures air cylinders and other pneumatic work devices.

Antarctic operation includes welding

Equipment for the second U. S. Navy scientific expedition to the Antarctic will include two twin arc welders. The arc welders will be used in construction of metal fuel storage tanks and other welding.

The task force of Operation Deepfreeze I, which returned to the United States early this year, has smoothed the way for Operation Deepfreeze II scheduled to leave in October for the Little America area, made famous by the expeditions of Admiral Richard E. Byrd.

Other equipment needed for operation in the extreme Antarctic climate includes bulldozers, tractors and powerful electric generators. All supplies must be moved in and human life may suddenly depend upon the proper functioning of this equipment.

Although a settlement has been established by the first task force the second plans to establish three new stations.

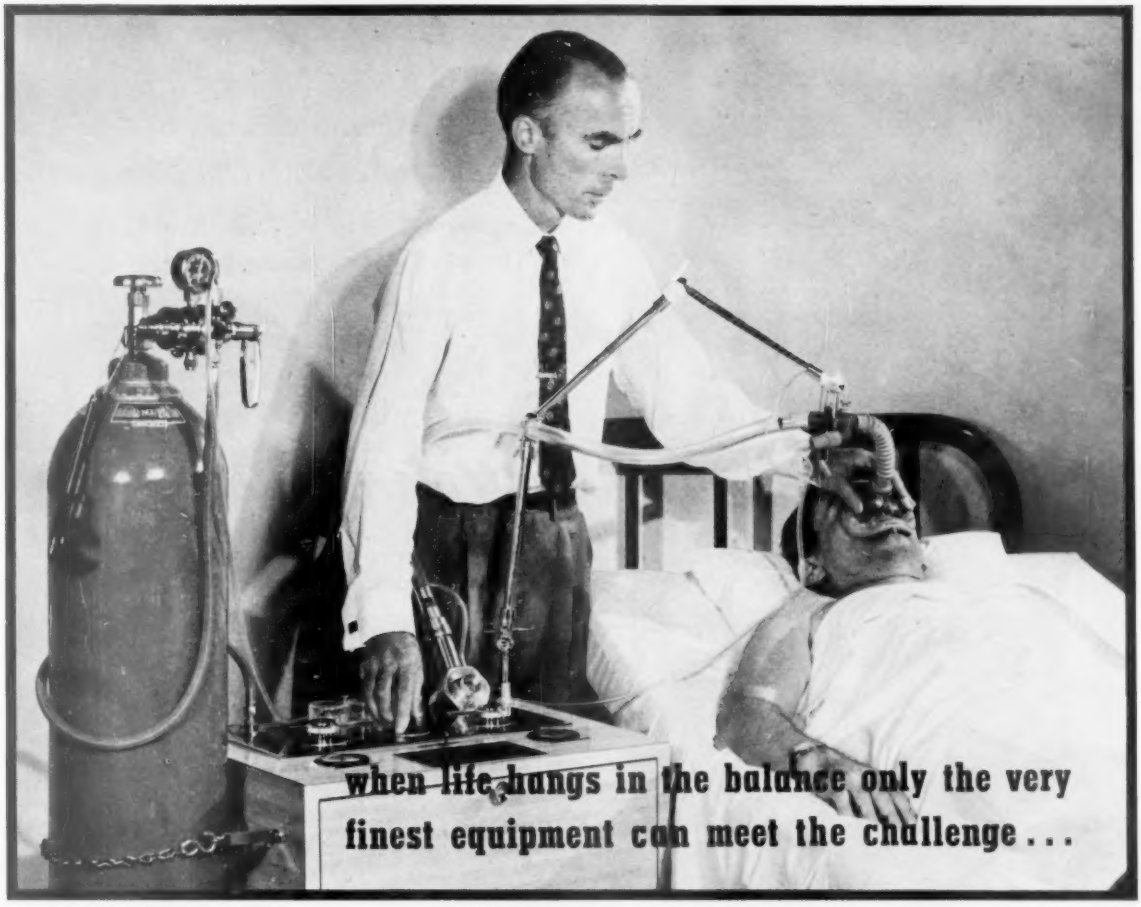
—Caterpillar Tractor Co.

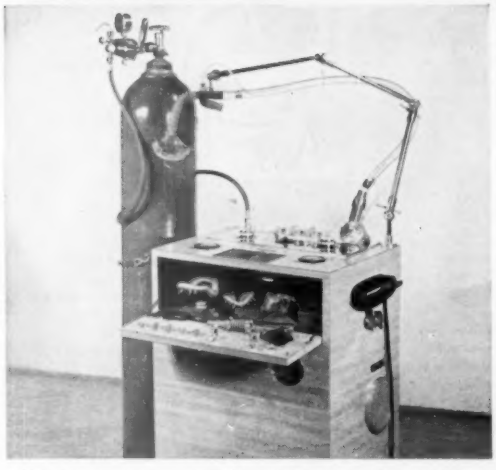
Johnston & Funk enters titanium field

Another entry into the rapidly expanding titanium industry is Johnston & Funk Titanium Corp., Wooster, Ohio. The firm was organized recently by James H. Johnston and Edward R. Funk.

Johnston & Funk is building its production capacity to fit the distinc-

(Continued on page 78)





The Bennett Pressure Breathing Unit—a complete hospital resuscitator and respirator—regulator by NATIONAL of California.

Continuously adequate respiration is vital to life and recovery — that is why various Bennett Pressure Breathing Units are equipped with regulators made by NATIONAL of California.

The Bennett Valve, originally designed for aviation high altitude research, is the heart of all Bennett Pressure Breathing Units. This valve is a unique flow-sensitive mechanism which permits the patient to actuate the unit in his own natural breathing pattern; or—to be resuscitated automatically if his breathing falters or stops. Various Bennett Pressure Breathing Units are manufactured by V. RAY BENNETT AND ASSOCIATES, INC.—because the very best and most dependable pressure regulators are vital in such life-sustaining units, this fine and experienced manufacturer has standardized on the dependable regulators made by NATIONAL of California.

The dependability, the long life and pressure accuracy of these regulators have made them the choice of the vast majority of all life-saving equipment manufacturers and these, also, are the soundest reasons why anyone employing cylinder gases in the welding industry will receive maximum satisfaction from these internationally known products.

National of . . . california

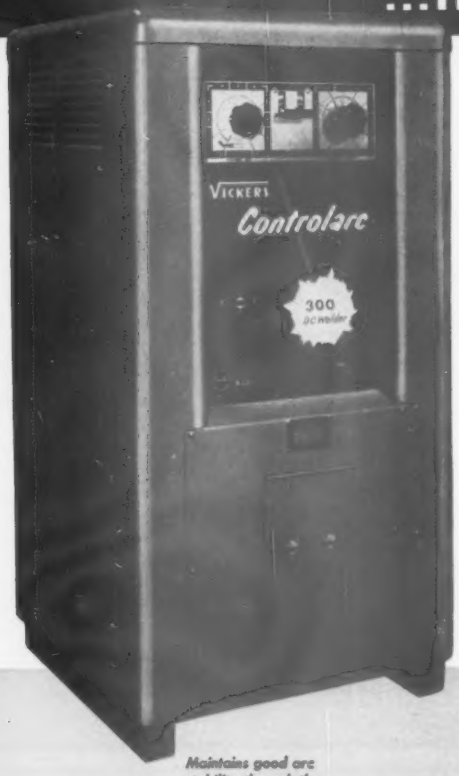
We cordially invite you to write today — for free copy of a beautifully illustrated, 44 page brochure.

547 DEPT.

NATIONAL welding equipment company... 218 fremont street san francisco 5 california

VERSATILITY

...THROUGH ENGINEERING

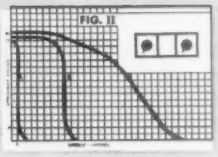


another Vickers FIRST for better welding

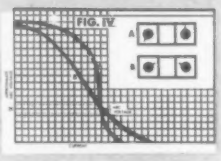
VICKERS

Controlarc DC Welder

1. **Engineered for dependable, long lasting service.**
2. **Covers wide range of welding jobs.**
3. **Excellent in its performance on many critical or hard-to-weld jobs.**



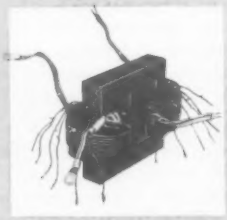
Maintains good arc stability through the complete current range from extremely low to extremely high without range switches.



Can bend the volt-ampere curve to meet the particular welding job being done.

Gives complete automatic arc control in any welding position.

Can strike an arc without the use of high frequency when using inert gas and tungsten at extremely low currents.



Exclusive, patented Magnetic Amplifier combines fine control with ruggedness and durability.

Exclusive dual remote control equipment available provides close control of complete current and voltage range.

WRITE TODAY for complete information and literature on these and other items of versatility such as low spatter performance on special electrodes, etc.

Some territories open for qualified dealers. Write for details.

VICKERS ELECTRIC DIVISION

VICKERS INCORPORATED a unit of Sperry Rand Corporation

1851 LOCUST STREET • SAINT LOUIS 3, MISSOURI

Versatile—Dependable

INCO-ROD "A" electrode fills a long-felt need.

It joins many combinations of dissimilar alloys.

Use INCO-ROD "A" electrode to weld mild steel to 304, for example. Or 405 to 304. Or Monel* nickel-copper alloy to 410. Or 347 to Inconel* nickel-chromium alloy.

With each combination, the weld is strong and ductile . . . of X-ray quality. Corrosion resistance and mechanical properties usually equal or exceed those of the base metal. What's more, operability is excellent in any position . . . spray type arc . . . good slag removal.

More than thirty such combinations have been welded successfully with INCO-ROD "A" electrode. Industry is trying many other combinations . . . both between and among ferritic and austenitic stainless steels, low alloy steels, mild steels, high nickel alloys, and other types of alloys.

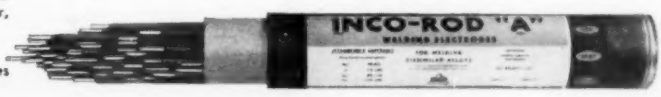
Better than 90% of all such jobs can be handled with this one versatile, new electrode . . . INCO-ROD "A"... the one with the *green* flux coating.

For welding data on *proven* combinations between common alloys, write for 'Announcing INCO-ROD "A"... a new Inco folder. Be sure, too, to ask about alloys *you* commonly join. New data, not yet published, is constantly coming in from the field.

The INTERNATIONAL NICKEL COMPANY, Inc.
67 Wall Street New York 5, N. Y.

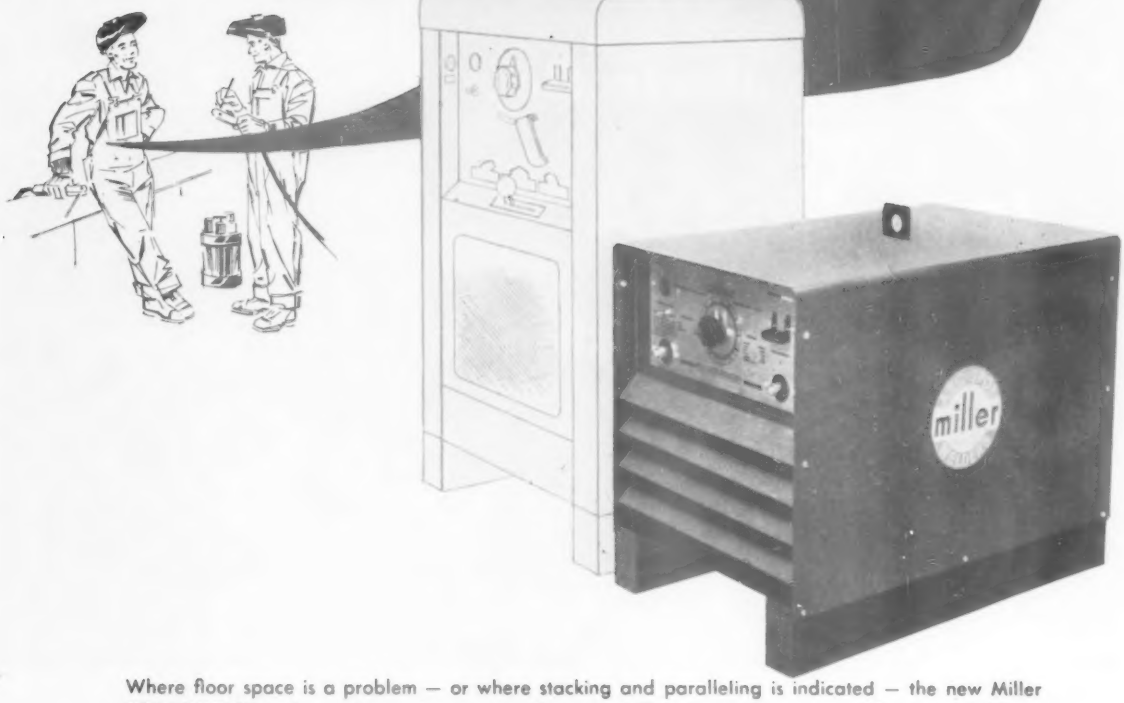
*Trade Mark of The International Nickel Company, Inc.

Four convenient sizes handily packed. INCO-ROD "A" electrode is supplied in 14-inch lengths in four diameters, 3/32", 1/8", 5/32" and 3/16-inch (the 3/32-inch is center grip) packed in 5-lb., tubular, asphalt-lined, protective containers (NEMA color coded).



INCO **Welding Products** • electrodes, wires, fluxes

say, see the new **miller** *SRH low-boy?*



Where floor space is a problem — or where stacking and paralleling is indicated — the new Miller SRH LOWBOY is the engineered-to-your-needs answer! This dc rectifier type welder is available in three models with 60% duty ratings of 200, 300 and 400 amperes. Combining compactness with quiet operation, minimum arc blow, top electrical efficiency and waterproof construction, the LOW-BOY is *another* Miller first that "figures."

Upright SR models to 600 amperes at 40 volts with 750 amperes maximum output; Duplex units up to 1200 amperes, 40 volts, 1500 amperes maximum.

". . . if it's MILLER you know it's the finest . . ."

New

MILLER ARCWELD welding electrodes are worthy of the MILLER name and reputation. Ask your distributor for some . . . you'll like the job they do.

miller

ELECTRIC MANUFACTURING CO., INC.

APPLETON, WISCONSIN

Distributed in Canada by
Canadian Liquid Air Co., Ltd.,
Montreal, P.Q.

THE BFR WHEEL is outstanding for light weld grinding, blending contours and corners, removing rust and scale, scarfing and beveling before welding. This soft-action, semi-flexible hub-type wheel has cotton fabric reinforcement with additional layer of Nylon.

THE BD WHEEL is ideal for heavier weld grinding jobs, smoothing flame-cut edges and stainless steel welds, many slotting, notching and cutting-off operations and removing light fins from castings. Glass cloth plus Nylon is the reinforcement in this rigid hub-type wheel.

LIGHT or HEAVY

Norton Reinforced Wheels bring the money-saving "TOUCH of GOLD" to countless weld grinding jobs

Two of the most popular Norton reinforced hub-type wheels — the semi-flexible BFR for light duty and the rigid BD for heavier work — make a team that can't be beaten for all-around usefulness. Separately, each handles a considerable number of grinding jobs. Together, they cover an almost endless list of applications, ranging from lightest scale removal to finishing heavy stainless steel welds. And they do every job with the extra safety, service life and economy that adds the profit-building "Touch of Gold" to your grinding operations.

Where regular type abrasive wheels are called for, remember that the Norton line is 100% complete, with shapes and sizes for every application. In particular, B-11 resinoid bonded wheels for your heavier jobs have the uniformity of structure and perfect balance that results in easier, faster, more profitable grinding.

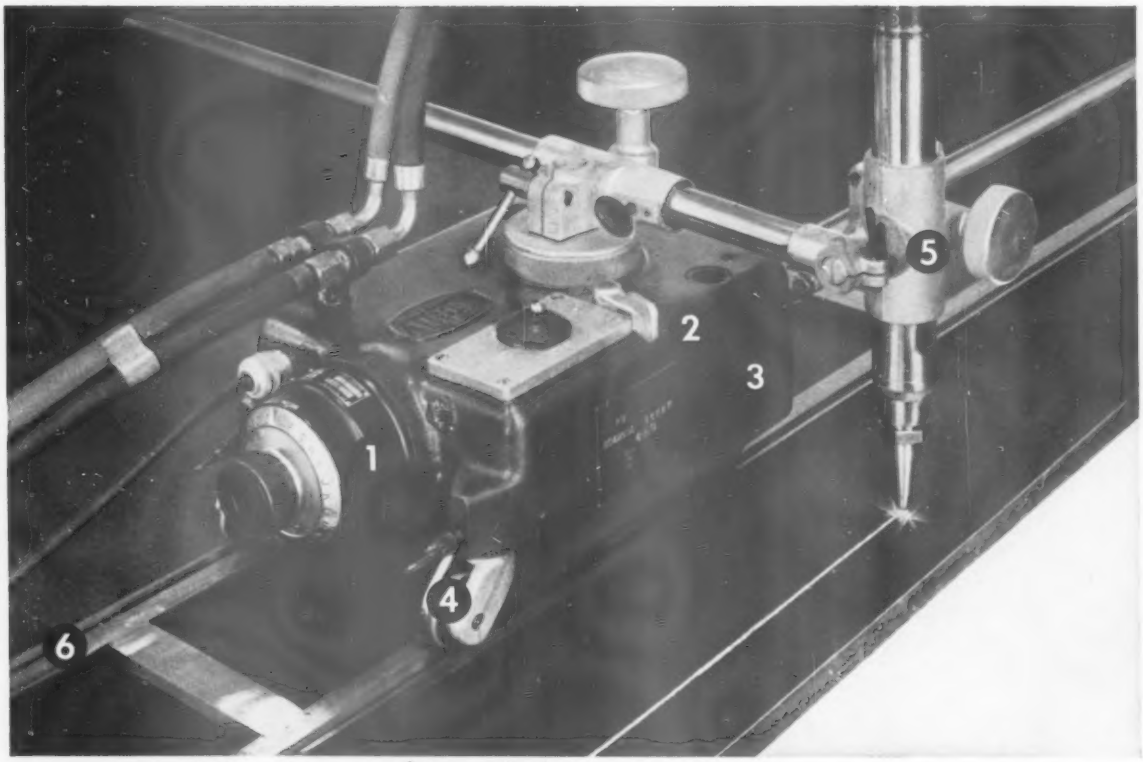
See Your Norton Distributor or write the nearest district office of NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. Behr-Manning Company, Troy, N. Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

W-1710

NORTON
ABRASIVES
Making better products... to make your products better

NORTON PRODUCTS: Abrasives Grinding Wheels • Grinding Machines Refractories

BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening Stones • Behr-cat Tapes



Quality in Details! these factors make the Airco #10 Radiagraph your best buy

The #10 Radiagraph is a portable (43 lb) gas cutting machine designed to cut metals up to 6" thickness. It will cut straight lines of any length, circles from 3" to 85" diameter, arcs up to a radius of 42½" – all with square or beveled edges. Designed to provide the greatest degree of cutting accuracy and convenience of operation, the husky overall construction of the #10 has made it an indispensable tool wherever steel is to be cut to size for fabrication. Here are a few of the *quality details* that don't meet the eye:

1. *Governor Control Variable Speed Motor* puts the entire speed range (4 to 50 ipm) at operator's fingertips. An indicator showing all speed settings is provided. Speed can be increased or decreased while cutting is in progress... speed is not affected by load or voltage changes.

2. *Clutch Lever* allows the machine to be rolled freely in either direction. This feature is a time-saver when aligning the machine with work.

3. *Drive Shaft* (under housing) runs on replaceable needle bearings which reduce friction to a minimum and affords a maximum of free motion.

4. *Caster Wheels* run in a machined groove in track for greater machine stability and more accurate cutting.

5. *Torch Holder Assembly* is made of brass forgings which withstand more abuse than castings and have greater corrosion resistance than iron or steel.

6. *Track* is cold rolled steel with two machined grooves in which wheels travel, and has track sections with tongue and grooved joints for correct alignment when multiple lengths are used for progressive cutting.

Airco oxyacetylene shape cutting machines include the Airco Camograph, Monograph, Duograph, Oxygraph and Travograph. Write today for literature.

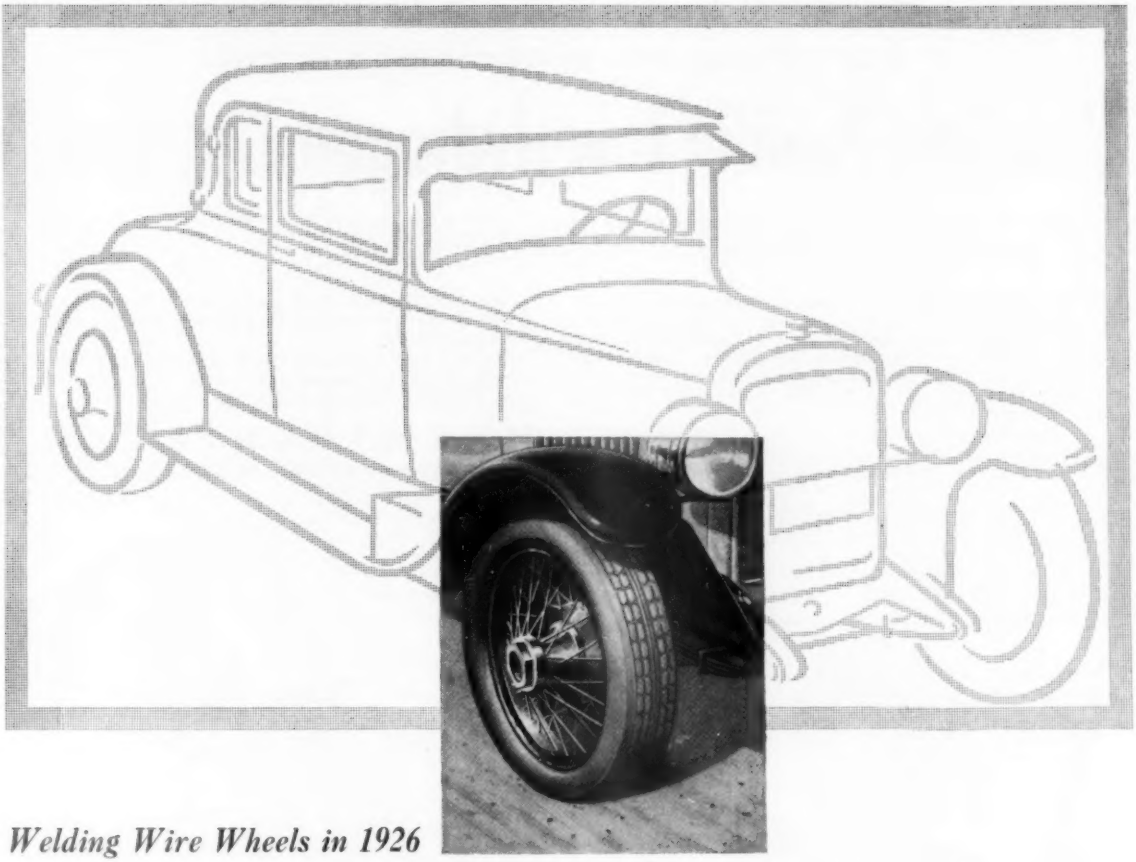
welding
AT THE FRONTIERS OF PROGRESS YOU'LL FIND...

AIRCO®
Offices and dealers in most principal cities

AIR REDUCTION SALES COMPANY
A division of Air Reduction Company, Incorporated, New York 17, N. Y.

On the west coast – Air Reduction Pacific Company
Internationally – Airco Company International
In Cuba – Cuban Air Products Corporation
In Canada – Air Reduction Canada Limited

Products of the divisions of Air Reduction Company, Incorporated, include: AIRCO – industrial gases, welding and cutting equipment, and acetylenic chemicals • PURECO – carbon dioxide, liquid-solid ("DRY-ICE") • OHIO – medical gases and hospital equipment • NATIONAL CARBIDE – pipeline acetylene and calcium carbide • COLTON – polyvinyl acetates, alcohols, and other synthetic resins.



Welding Wire Wheels in 1926

Helped MALLORY Learn Better Ways to Solve Your Welding Problems Today

THIRTY YEARS AGO, a leading auto manufacturer (still a leader today) ran into a serious production bottleneck in resistance welding of wire wheels. The copper dies being used wore out so quickly that costs were too high, production too slow.

Elkonite®, a material developed by Mallory, looked promising for this application. It was tried . . . and the results were excellent. Die life increased tenfold. And production was freed of stoppage troubles.

This development marked Mallory's entry into the resistance welding field. It has been followed, in succeeding years, by a continuous stream of contributions to welding technology. These are some of the major milestones in Mallory progress:

Specialized alloys, like Elkaloy® A, Mallory 3, Mallory 22 and many others, which provide a family of materials engineered for the specific needs of welding service.

Fluted electrodes, which greatly increase electrode life.

Cold forming methods for producing bent electrodes with greater hardness and strength.

Special holder designs to meet the needs for higher pressures for large welding machines, and low pressures for non-ferrous alloys.

The knowledge gained during three decades of pioneering activity and constant development stands ready to serve on your own resistance welding problems. Write or call Mallory for a personal consultation by a Mallory welding engineer . . . and see your local Mallory welding distributor for prompt delivery of the best in welding electrodes, holders, seam welding wheels, forgings and supplies.

In Canada, made and sold by Johnson Matthey & Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario.

For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio.

30 Years of Welding Progress

P. R. MALLORY & CO. Inc.

MALLORY

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

The Speed of Iron Powder Plus the Quality of Low Hydrogen is combined in the

New Iron-Powder Low-Hydrogen Electrodes

for high-speed all-position welding

Now, with P&H Iron Powder-Low Hydrogen Electrodes, you get a cost-cutting rod that permits high-speed, all-position welding, even on "problem" steels. You not only get the improved bead appearance and low spatter of iron-powder electrodes, but also the superior physical properties and quality of low-hydrogen rods.

P&H Iron Powder-Low Hydrogen Rods are recommended for welding of heavy sections exposed to severe shock and abuse. They give you welds of X-Ray quality with good impact properties at low temperatures. Moreover, you get smooth fillets without special effort.

Choose from a complete selection of P&H Iron Powder-Low Hydrogen Electrodes with tensile strengths from 70,000 to 85,000 psi.

HARNISCHFEGER
MILWAUKEE 46, WISCONSIN

I'M SMOOTHARC SCOTTY . . .
and if you're like me you never pass up a chance to save an extra nickel. P&H Iron Powder-Low Hydrogen Rods save more than that. Our FREE literature tells you how.

Send coupon for free information

P&H HARNISCHFEGER CORPORATION
Welding Division
4513 West National Avenue, Milwaukee 46, Wis.
Attention: W. R. Stephens, Sales Manager
Please send me more information on P&H Iron Powder-Low Hydrogen Electrodes.

Name ..... Title .....
Company .....
Address .....
City ..... Zone ..... State .....
3083

the P&H Line

P&H welding equipment is manufactured and sold in Canada by REGENT EQUIPMENT MANUFACTURING COMPANY LTD., 455 King Street West • Toronto, Ontario, Canada

JUNE
1956

Your *WeldWorld*

at press time

Last minute news of interest to those engaged in joining and severing materials.

. . General confidence is strongly indicated as business works toward the close of the second quarter of 1956. Capital outlays this year should be at least 22% greater than the 1955 record of $28.7 billion, according to the annual Commerce Dept.-SEC survey of plant and equipment spending.

. . Recent reports from several welding equipment manufacturers seem to indicate that first quarter net income in the industry will exceed net income of the similar 1955 period by a whopping 75%.

. . Steel prices are due to go up $10 to $20 per ton in July after tenth-round wage increases are granted—which will be soon. If this price boost goes through, it will be the biggest raise in the history of U. S. steel producers—and probably the most unpopular.

. . In a reversal of trend, world market price of copper for the first time in many years is lower than domestic market price. Thus, a decrease in the price of domestic copper is foreseen.

. . The increasingly serious nickel shortage has created further plans for the release of 40 million lb of nickel from strategic stockpiles to private industry. Total nickel released by the government so far in 1956 now amounts to more than 50 million lb.

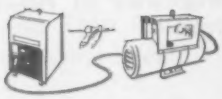
. . Coming as an adjunct to nickel scarcity is the possible government move to buy nickel at market price from those companies increasing production. Announcement of this proposed plan came simultaneously with increase in expansion goal for nickel. Old mark: 380 million lb annually; new goal: 400 million lb.

. . Housing starts are showing a slight increase and cutbacks in auto production have been halted. The automotive, nonferrous metals, iron and steel, chemical, paper and railroad industries plan to increase spending at least 40% over last year.

. . A welding machine manufacturer—Vickers Electric—has been awarded a contract to build the automatic pilot for the earth satellite rockets to be released in the not-too-distant future.

. . The government is thinking of getting out of some of the more than 30,000 business enterprises it operates. One business to be given up, maybe, is an acetylene producing plant presently operated by the Defense Dept.

. . Sintered preforms of silver, copper, manganese, etc.—in any desired shape or size—are the latest thing in brazing alloys. They are said to be strong enough to withstand rough handling.



. . Leather prices, already high, will be going up in some quarters soon. Look for price increase in protective weldors' clothing.

. . Thirty-one states have approved a proposal to submit a Constitutional amendment limiting the maximum tax against incomes to 25% of total annual peacetime earnings of an individual taxpayer. Only one state to go and Congress must act.

. . Among other things, June will bring us Dairy Month, Let's Play Golf Week and National Hillbilly Homecoming Week.

STAINLESS STEEL WELDING WIRE...

Spooled... layer wound to assure a smooth, even feed. Sizes: .035", .045", 1/16", 5/64" and 3/32" diameters.

Coiled... layer wound on rims for submerged arc welding. Sizes: 1/16", 5/64", 3/32", 1/8", 5/32", 3/16" and 1/4" diameters.

Cut Lengths... straightened and cut wire furnished in 36" lengths for inert arc and gas welding.

Sizes: .035", .045", 1/16", 5/64", 3/32", 1/8", 5/32", 3/16" and 1/4" diameters.

Two factors give

Drawalloy

CORPORATION

WELDING WIRE

best on-the-job performance

Drawalloy welding wire is a product of two factors—years of experience in the welding industry combined with the best wire mill drawing practices. The result is clean welding wire with the proper finish, temper, diameter tolerance and chemical analysis. It's a wire that produces the highest quality welds continuously—with an easy, sure feed and a constant, smooth arc.

See your distributor or write Drawalloy Corporation, Lincoln Highway at Alloy Street, York 12, Pennsylvania

WEAR-O-MATIC HARD-FACING WIRE...

Coiled... precision drawn for perfect roundness to insure continuous, smooth feed with any automatic head. Available in six Types for hard-facing applications.

Drawalloy

CORPORATION

The Wire Mill For The Welding Industry

YORK, PENNSYLVANIA

SIMPLIFIES DESIGN

SIMPLIFIES BUYING

SIMPLIFIES INSTALLATION

Makes your work easier!

EVERYONE who specifies, buys and uses welding fittings and flanges has a mighty good reason for insisting on TUBE-TURN* products. *They simplify his work!* Being the world's most complete line, they *simplify piping design.* All available from one nearby source, they *simplify purchasing.* Of unsurpassed uniformity, they *simplify installation.*

These cost-cutting advantages are yours at no extra cost when you specify TUBE-TURN Welding Fittings and Flanges and buy from your nearby Tube Turns' Distributor. You get *more for your dollar* with this leading brand!

The Leading Manufacturer of Welding Fittings and Flanges

TUBE TURNS LOUISVILLE 1 KENTUCKY

A DIVISION OF NATIONAL CYLINDER GAS COMPANY

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Cleveland • Detroit • Chicago
Kansas City • Denver • Los Angeles • San Francisco • Seattle • Atlanta
Tulsa • Houston • Dallas • Midland, Texas

*"TUBE-TURN" and "tt" Reg. U.S. Pat. Off.

HERE'S HOW...

How TUBE-TURN Welding Fittings and Flanges

SIMPLIFY YOUR WORK

ENGINEERING

You can specify TUBE-TURN Welding Fittings and Flanges and know that you'll get the exact answer to your problem. The line includes all types in all piping materials, schedules and sizes. Also, Tube Turns offers you engineering assistance and helpful design literature.

PURCHASING

Tube Turns offers you outstanding distributor service . . . local stocks, geared for fast service. You can depend on this source for *all* your needs in welding fittings and flanges. One order . . . one source saves purchasing time.

INSTALLATION

Welders are enthusiastic about TUBE-TURN products because they fit up true, and elbows can be cut to odd angles with perfect alignment. Rigid inspection and quality control by Tube Turns assures absolute dimensional accuracy and uniformity.

NEW BOOKLET—This new Tube Turns' booklet gives helpful information on pipe, fitting and flange materials. Mail the coupon for your free copy.

TUBE TURNS, Dept. N-3
224 East Broadway, Louisville 1, Kentucky

Please send free copy of Pipe, Fitting and Flange Materials.

Company Name _____

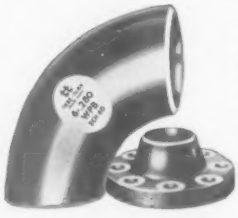
Company Address _____

City _____ *Zone* ____ *State* _____

Your Name _____

Position _____

Available from your nearby TUBE TURNS' distributor



DISTRICT OFFICES:

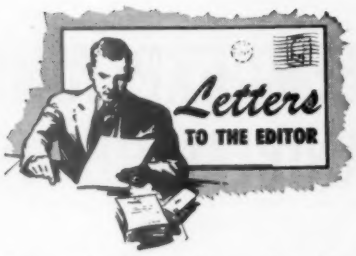
New York	Los Angeles
Philadelphia	San Francisco
Pittsburgh	Seattle
Cleveland	Atlanta
Detroit	Tulsa
Chicago	Houston
Kansas City	Dallas
Denver	Midland, Texas

*"TUBE-TURN" and "⊞" Reg. U. S. Pat. Off.

TUBE TURNS

LOUISVILLE 1, KENTUCKY

A DIVISION OF NATIONAL CYLINDER GAS COMPANY



Letters should be addressed to: The Editor, WELDING ENGINEER, 12 E. Grand Ave., Chicago 11, Ill. No letter will be published unless signed, but your name will be withheld if requested.

Welding dilemma

Dear Sir:

I enjoyed reading the May editorial, "Teach 'em to weld—here's how!" It certainly puts the situation in regard to welding instruction out into the open.

I am very sympathetic to the problems you raise, namely, that it is most desirable for all engineers to have a direct knowledge of welding and its techniques.

However, the position of the educator in these times is that of deciding which of the courses, so desirable in every curriculum, can be kept and which must be removed to make room for those more pressing. Unfortunately, welding instruction in colleges is under real pressure from these other courses and I have serious doubts as to how long it will be able to hold up in the face of the pressure against it.

B. H. Jennings
Northwestern University

"Teach 'em to weld"

Dear Sir:

I have read your editorial "Teach 'em to weld" in the April issue and believe you have stressed a point that should most certainly help welding, and that is developing more welding engineers.

At the present time, I am of the opinion that too few colleges and engineering schools offer majors in welding engineering. The sooner more of this is done, the greater will be the use of welded design.

John D. Orr
Hadley Technical High School

Dear Sir:

I was very interested in the editorial in the April issue. It discusses a situation that is becoming increasingly apparent to the rank and file of weldors.

Our industry is in a deplorable state. I can cite instances in which unqualified men are pressed into service where their duties are far beyond their capabilities,

(Continued on page 63)

Model H Cone and Chisel one of 27 models

WHATEVER STYLE TOMAHAWK YOU BUY FOR YOUR JOB - BE SURE ITS ATLAS QUALITY

B-1 "Re-Bit" Dual Tool 10½" 16 oz.
B1-W "Re-Bit" Dual Tool 10½" 15 oz.
Model A Dual Tool 10½" 17 oz.
Model AW Dual Tool 10½" 16 oz.
Model E-1 "Re-Bit" 9" 12 oz.
Model E1-W "Re-Bit" 9" 10 oz.
Model F-1 "Re-Bit" 10" 16 oz.
Model F1W "Re-Bit" 10" 14 oz.
Model G Chisel & X-Chisel 9" 14 oz.
H-9" 14 oz. L-10" 17 oz. Cone & Chisel
Model I Chisel & X-Chisel 9" 13 oz.
J-9" 13 oz. N-10" 15 oz. Cone & Chisel
LCP-10" 17 oz. HCP-9" 14 oz. Cone & X-Chisel
Model K Cone & X-Chisel 10" 17 oz.
JCP-9" 13 oz. NCP-10" 15 oz. Cone & X-Chisel
Model M Chisel & X-Chisel 10" 15 oz.
Models WH: 10-20-30 12" 14 oz.
Model C "Re-Bit" Chisel & symbol
Model CW "Re-Bit" Chisel & symbol
Models OCC—OCP—ODC 9½" 10 oz.

You Can't Beat ATLAS Quality

The modern Atlas plant is devoted exclusively to building the finest weld cleaning tools in America. There are models to suit the man and every type work. If you haven't tried Atlas you don't know what a difference "balance and feel" can make in production and quality of work. They can take it.

ATLAS WELDING ACCESSORIES INC.

707 E. LEWISTON AVENUE, FERNDALE 20 (DETROIT) MICH.

A Report on Automatic Arc Welding

A G-E WELDING ENGINEER EXPLAINS ARE TURNING MORE AND MORE TO

Roger W. Tuthill, Welding Process Engineer for the General Electric Company's Welding Department, answers some of the more frequently asked questions about the gas-shielded, consumable-electrode welding process.

Mr. Tuthill's answers explain the increased attention this process is receiving from production and welding people as automation begins to make greater demands on production welding.

Mr. Tuthill has been active in research and development on Fillerarc welding, General Electric's gas-shielded process, and has had a number of papers published on the subject.

Q. What is the gas-shielded welding process?

A. Gas-shielded welding is a consumable-electrode arc welding process which uses a reel of bare electrode wire fed mechanically through a welding head. Gas, such as carbon dioxide or argon, flows around the electrode to form a protective shield about the arc.

Q. Is there anything particularly new about gas-shielded arc welding?

A. Yes—if you're talking about *automatic* gas-shielded arc welding!

Historically, powdered flux has been used as the shielding agent in automatic arc welding, mainly because no gas process was economically feasible for welding mild steel. However, gas-shielding was attractive to many prospective users because it eliminated the many problems created by the use of flux—expensive flux recovery systems, flux inclusions in welds, flux in the air, more precise fixture requirements, and other difficulties.

Gas-shielding has been used for welding non-ferrous and stainless steels, but the relatively high costs of the inert gases used made gas-shielding impractical for mild steels.

Recently, the successful application of low-cost carbon dioxide as a shielding gas has finally made it economical to use gas-shielded equipment for welding mild steels. For example gas savings of 90% over inert gas costs have been reported. Since by far the most welding being done today is on mild steel, it is easy to see why this development is causing so many production people to turn to automatic gas-shielded arc-welding for answers to their production welding problems.

Q. Does a gas-shielded automatic welding system cost any more than other automatic arc welding systems?

A. The cost of setting up a gas-shielded system is about the same as for a comparable submerged-arc automatic system.

For example, while the *purchase* price of gas-shielded automatic equipment may be more than that of a submerged-arc system, the fact that there is no need for installing expensive flux recovery equipment and other cleaning systems with gas-shielded welding easily makes up the purchase price difference.

Q. Does the quality of welding done with gas-shielding compare with other welding processes?

A. Quality of welds made with the gas-shielded automatic welding process compares very favorably with other processes. Since no flux is used there is no possibility of flux inclusions; penetration is usually deeper; and the visible arc permits full control during welding. This visible arc permits less expensive fixtures to be used, an important cost factor in automatic welding.

Q. How about the speed and flexibility of a gas-shielded system? Can it be easily integrated into a production line?

A. A gas-shielded system can be used in production line welding as easily as any automatic welding system.

For example, the G-E Fillerarc system has electrode wire feed speeds which range up to 1000 inches per minute.

WHY FABRICATORS OF MILD STEEL AUTOMATIC GAS-SHIELDED WELDING

The automatic head can be rotated through 360 degrees and can be used for circular or seam welds, and, if necessary, more than one welding head can be used to make multiple welds.

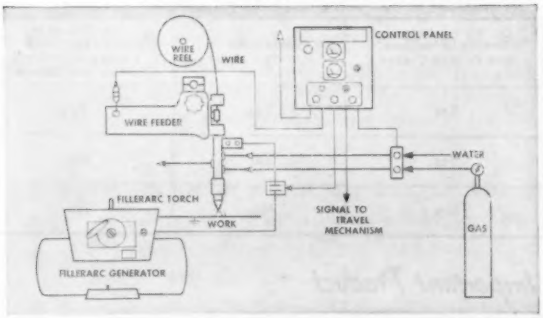
These characteristics make the Fillerarc system flexible and fast enough for almost any production line. Perhaps of equal importance to production people is the system's insensitivity to incoming line voltage, which assures constant production speed and weld quality.

Q. To sum up, what are the really important advantages of the automatic gas-shielded welding process?

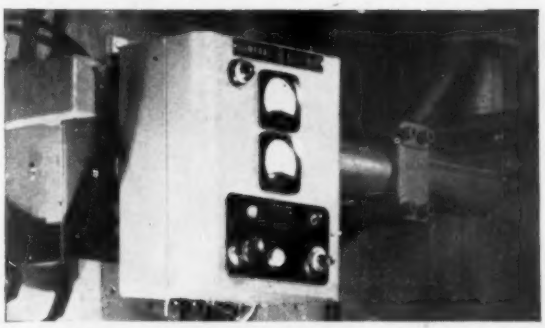
A. In a few words, the most important advantages of the automatic gas-shielded process are flexibility, high welding speeds, uniform weld quality, elimination of the cleaning problems associated with the use of flux, versatility for use with all types of metals, and most important of all, the ability to use low-cost carbon dioxide for shielding.

For more information about Fillerarc automatic gas-shielded welding see your nearby G-E Welding Distributor, or write for Bulletin GEC-1334, Section 713-4, General Electric Company, Schenectady, N. Y.

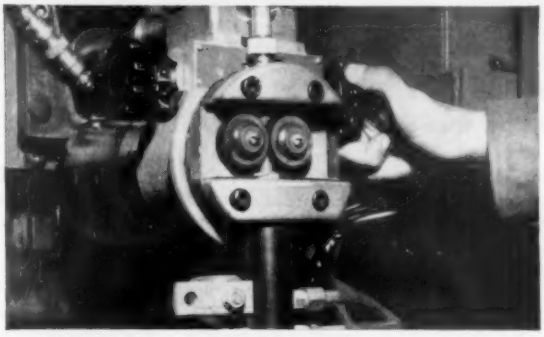
Now, General Electric offers *four* power sources for automatic gas-shielded welding—three new 800-amp rectifier welders and the already-proved 450-amp Fillerarc motor-generator set. They offer a complete choice of output characteristics and automatic features to suit your welding needs.



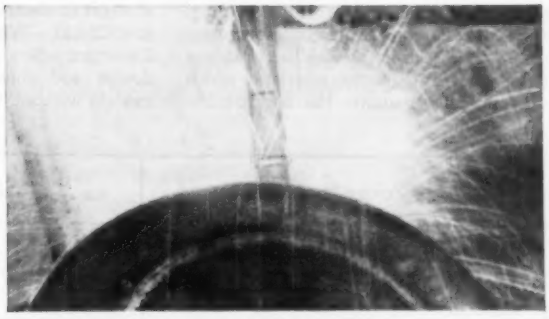
G-E FILLERARC EQUIPMENT is the only complete equipment especially designed for consumable-electrode, gas-shielded welding. Simplicity of the system makes possible use of less expensive fixtures and greater over-all efficiency.



WIDE RANGE OF WIRE-FEED SPEEDS—up to 1000 inches per minute—makes the G-E Fillerarc system flexible enough for any production line. Speed is constant since system is insensitive to normal line-voltage changes.



FLEXIBILITY OF FILLERARC SYSTEM is also demonstrated by the automatic head. It rotates 360 degrees, allowing even overhead welding. Arc is completely visible since gas is used as the shield instead of flux.



CIRCULAR OR SEAM WELDS may be made on stainless steel, copper, aluminum, and other metals—using inert gas. Fillerarc power sources, rectifier or motor-generator, and carbon dioxide combine for low-cost, quality welds on mild steel.

Progress Is Our Most Important Product

GENERAL ELECTRIC

3 NEW G-E Power Sources for Automatic Welding

Now, three new General Electric 800-amp rectifier welders join the already-proved Fillerarc 450-amp motor-generator set as power sources for the expanding gas-shielded automatic welding process.

The three new power sources are designated FILLERARC, REGULARC, and DIRECTARC and offer a complete choice of output characteristics and automatic features. (See comparison chart below.)

FILLERARC—gives you the ideal power source for automatic gas-shielded welding. Like the 450-amp Fillerarc motor-generator, this rectifier welder has a unique rising volt-ampere characteristic which automatically matches the arc requirements for all electrode wire feed speeds. It is immune to changes in incoming line voltage, thus assuring consistent weld quality.

REGULARC—The first *true* constant-potential power source offered for automatic welding, this welder provides all the features of the Fillerarc model except that it has a flat volt-ampere characteristic. This is the set for you if your application requires regulation of incoming line voltage and only relatively small changes in electrode wire feed speeds.

DIRECTARC—With minimum investment, Directarc offers the same high quality design and construction of the other models without the automatic features. Directarc is the choice for you if you have a well-regulated incoming line voltage and your application requires only one arc length and electrode wire-feed speed.

QUALITY RECTIFIER FEATURES — All three models offer the same high quality you've come to expect in G-E rectifier welders—quiet operation, combination cleaning-cooling fan, easily removable side covers, and Class H silicone insulation.

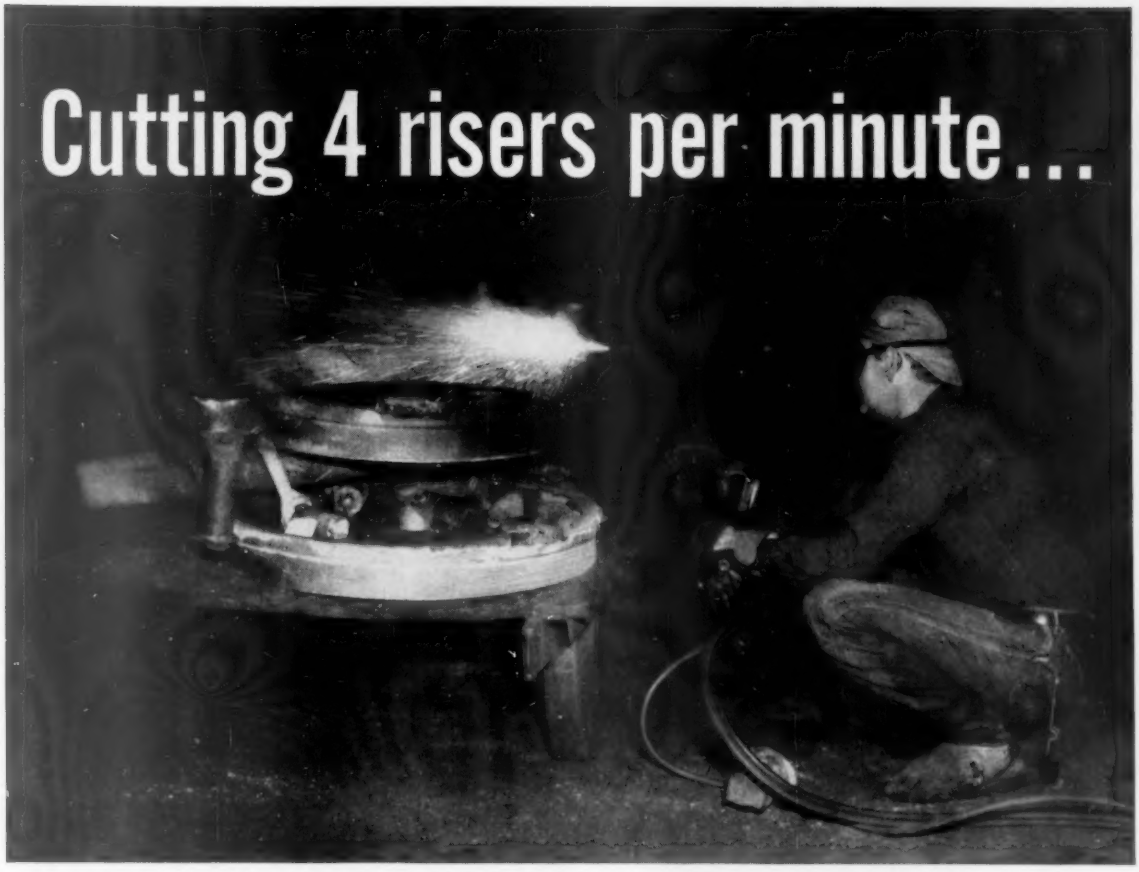
For more information see your nearby G-E Welding Distributor (He's listed in the yellow pages of your phone book) or write Section 713-5, General Electric Company, Schenectady 5, N. Y.

Power Source	Output Volt-ampere curve	Immune to Incoming Line Voltage Change	Adjustable Starting Voltage	No Change in Arc Length with Change in Electrode Wire Feed Speed
FILLERARC	Rising	Yes	Yes	Yes
REGULARC	Flat	Yes	Yes	No
DIRECTARC	Essentially Flat	No	No	No

Progress Is Our Most Important Product

GENERAL ELECTRIC

Cutting 4 risers per minute...



Lightweight and easy to handle, this OXWELD powder-cutting blowpipe makes fast work of risers.

Powder-Cutting speeds removal operations 300%

Removing risers from stainless steel castings need no longer be costly and time consuming. Pictured above is a typical powder-cutting operation at the Ohio Steel Foundry Company, Springfield, Ohio. Here, 2 by 4 inch thick stainless steel risers are removed by powder-cutting in only 15 seconds. By methods previously used, this operation took up to four times longer.

In the powder-cutting process metal powder is automatically injected into an oxygen flame to increase the flame's heat and severing action speed. The powder process is helping users gain new efficiency and speed in the removal of gates and risers, sand incrustations, and casting defects.

The powder-cutting blowpipe used in this operation, an OXWELD AC-4, is designed for hand cutting of oxidation resistant metals such as stainless steel, chrome alloys, and cast iron. Heavier apparatus is also available for manual and mechanized operations.

Increase your production and profit—call your local LINDE representative, or write for illustrated literature on LINDE's modern processes. Start saving now, do it today.

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto

"Linde" and "Oxweld" are registered trade-marks of Union Carbide and Carbon Corporation.

Linde
Trade-Mark

When one welder gives both AC and DC . . .

Handles every type of electrode . . .

Yet costs less to buy and operate . . .

WHY

shouldn't you be using IDEALARCS for your production welding.

IDEALARC . . . *one efficient welder for all your jobs.*
Furnished as an AC/DC welder or as a straight AC welder to which DC can be added at any time.

IDEALARC . . .

industry's most versatile welder

Certain electrodes work best on AC . . . others operate better on DC. Some rods that work best on DC in the smaller sizes work best on AC in the larger sizes. With still other rods, the opposite is true. IDEALARC, with its instant selection of AC or DC, gives optimum performance on every type and size of electrode.

There is no other welder like it

THE LINCOLN ELECTRIC COMPANY
Cleveland 17, Ohio

ONE DEPENDABLE SOURCE FOR ALL YOUR WELDING NEEDS

© 1956 The Lincoln Electric Company

SEND FOR BULLETIN 1343
MAIL COUPON OR WRITE

THE LINCOLN ELECTRIC COMPANY
Dept. 1716,
Cleveland 17, Ohio

☐ Send me Bulletin 1343 on Idealarc.
☐ Have representative call.

Company_____

Address_____

City_____ State_____

Name_____

Position_____

JUNE, 1956

Welding Engineer

ESTABLISHED 1916

A start in the right direction

THE SECOND week of May brought to Buffalo the most successful welding show ever held in America. It hardly seems possible that the question, "should we stand alone?", which was asked on this page some 11 years ago, would be so fully answered in such a short period of time.

In four years, the Welding Show has grown to the point where one of the advantages suggested for a separate welding show has been lost. *The Welding Show is getting too big to visit our smaller cities.*

The spring technical meeting was excellent, but some of the papers could have been more practical. One of the most practical suggestions to come out of the meeting was a proposal for a program to publicize welding.

Welding will never gain its rightful place as a modern means of joining metals and other materials until people know about it. Too few people are fully aware of the benefits mankind has derived from welding.

Most of us in the welding industry know in some detail the important role welding plays in our everyday lives. But our neighbors, whose vocations lie in other fields, have not been made properly cognizant of the importance of welding to them.

THERE are few businesses that can operate without welding or its related processes. In the metalworking field, there are now many plants that are wholly dependent upon welding as a means of joining and severing materials. For example, it is next to impossible to buy a pressure vessel or boiler that has been fabricated by a means other than welding.

Some of our shipyards are dependent upon welding as a means of joining many materials going into the ships they build. The transportation industry, in all of its phases from the bicycle to streamlined trains, uses welding extensively. In the manufacture of automobiles, welding has been instrumental in keeping the cost within the range of millions who own autos.

Very few of our neighbors can appreciate the work welding performs, the safety it provides, or the money it saves them.

Welding has not only made the modern motor car less costly, it has also reduced the cost and increased the supply of home appliances. The mass-produced refrigerators, automatic washers, driers and ranges are all excellent examples of the economical use of welding production.

WELDED rails have taken many of the "clicks" out of train rides to make rail travel more quiet and pleasing. Without welding, there would be no jet planes or atom bombs. Welded pipelines carry gas, oil and other vital fluids to all parts of our nation.

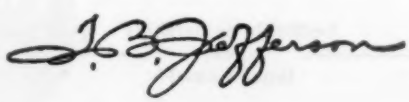
Welding has greatly increased the joys of living, yet not many know the part it has played.

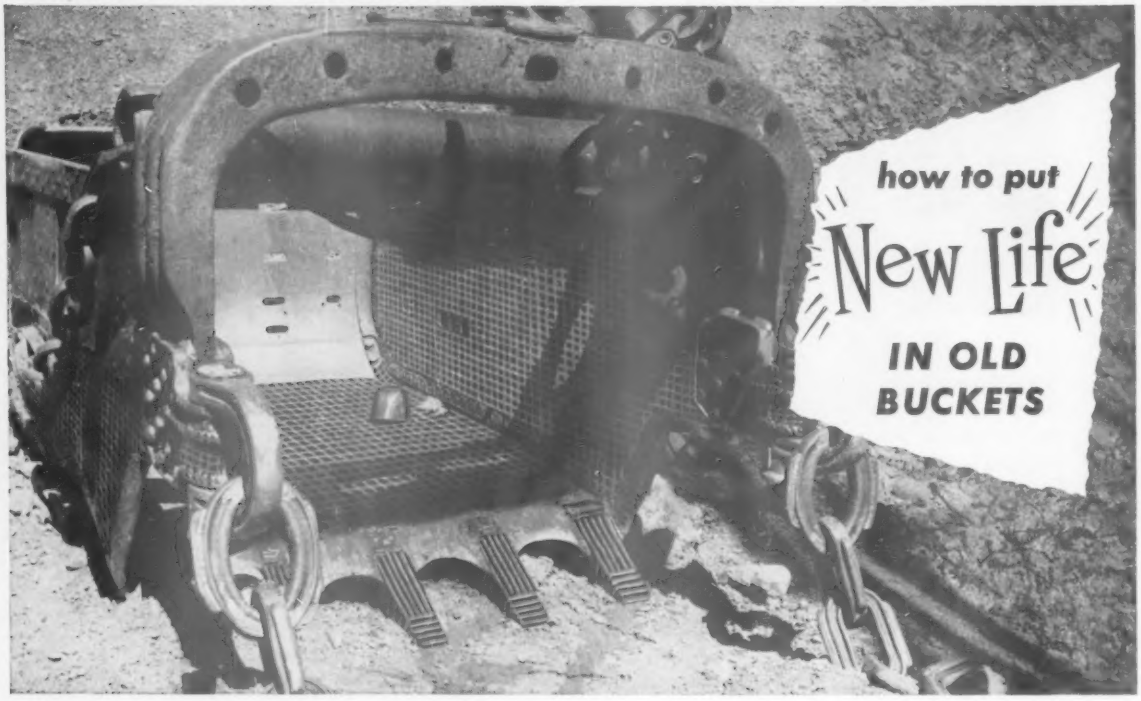
The program proposed to manufacturers at the Buffalo meeting, if effectively done, should go a long way toward improving the general public's knowledge of welding and its importance to their well-being. Let's hope that such a program is adopted. And when it is adopted, let's hope it meets a long-range goal of emphasizing the benefits *constantly* derived from *every* welding usage.

Welding has effected a savings of millions of dollars in the construction field, but how many architects and engineers fully understand the advantages of welding in building and bridge construction? There is a selling job to be done in this highly-competitive world!

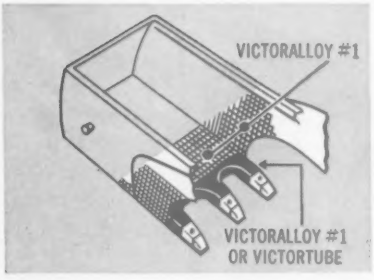
Welding is the answer, but the public must be made aware of its existence. Unfortunately, it can only be done in many instances by "spoon feeding" those who should be taking advantage of this modern metal-joining process.

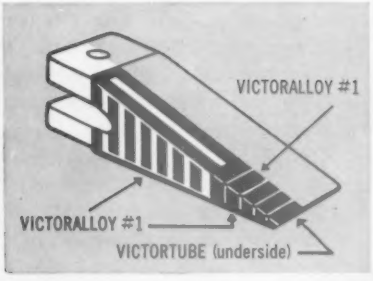
Let's hope this publicity plan is put into effect and directed to the proper people.





USE VICTOR HARDFACING





Buckets . . . Apply VICTORALLOY #1 to top and bottom of bucket lips in overlapping beads. Protect other parts or areas showing wear with stringer beads of VICTORALLOY #1. Use 3/16″ coated VICTORALLOY #1 at 170 to 190 amperes, a.c. or d.c., or ¼″ at 200 to 225 amperes. If wear is unusually severe, substitute VICTORITE on bucket lips; use 3/16″ coated at 120 to 150 amperes, a.c. or reverse-polarity d.c.

Teeth . . . Apply VICTORTUBE to underside from point upward about 2″, and VICTORALLOY #1 to upper side of tooth same distance. Use stringer beads of VICTORALLOY #1 on balance of upper and lower surfaces, and on edges. Use 3/16″ coated VICTORTUBE at 130 to 160 amperes, a.c. or reverse-polarity d.c., and 3/16″ coated VICTORALLOY at 170 to 190 amperes, a.c. or d.c.

Why guess? . . . Select the right alloy from VICTOR's complete hardfacing line, made for both gas and manual or automatic arc application. New VICTOR illustrated hardfacing manual tells which alloys to use, how to apply. Ask your VICTOR dealer or write us today for your free copy.

Profitable dealerships open; inquire now!

VICTOR for hardfacing

VICTOR EQUIPMENT COMPANY
ALLOY ROD & METAL DIVISION
Mfrs. of welding & cutting equipment; hardfacing rods; blasting nozzles.

19-H

11440 So. Alameda St. • Los Angeles 59

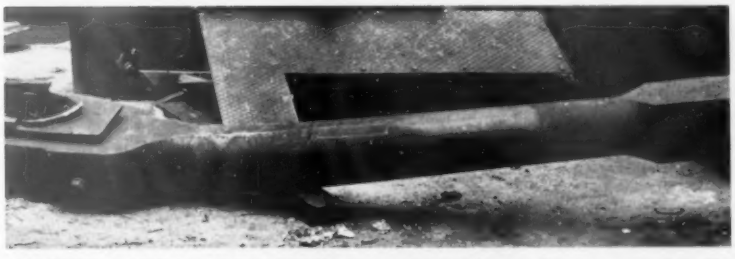
BRAZE-weldors repair the mill side of the rear portion of a bearing chuck damaged in accident. Top back lug, broken completely away, was restored by braze-welding process.

Braze-welding repairs a badly damaged steel mill engine

By **R. L. Rectenwald,** *President*
Maintenance Engineering Corp.
Pittsburgh, Pa.

EARLY on the morning of Oct. 6, 1955, the blooming mill engine at the United States Steel Corp.'s Clairton (Pa.) Works was wrecked without warning. A stuck throttle was blamed for the accident, which disabled the 4,500-hp, steam-driven engine for 10 days.

The connecting rod on the engine's high-pressure side was fractured at the crosshead bearing and the single crank pin on that side was pulled from the reverse taper fit of the disc. The 3,000-lb connecting rod was thrown from the engine.



BROKEN and bent, this 3,000-lb connecting rod was thrown out of mill engine and caused much of the damage repaired by braze-welding.

When the connecting rod was thrown free of the engine, that end of the crankshaft lifted, breaking the bearing cap. This upward thrust fractured the cast iron main frame on the high pressure side for approximately 26 ft. The fracture extended through the main bearing to the grouting.

In addition, the top back lug of the bearing chuck was broken completely away, as were top edges of the bearing chuck along the front side.

Additional Damage

Maintenance Engineering Corp. surveyed the damage and made preparations to start repairs as soon as the crankshaft was removed. After reviewing drawings, engineers noted that the internal rib extending along the center axis of the frame had also sustained a 4-ft fracture.

Oblique direction of the fractured lugs along the top of the bearing chuck indicated a need for braze-welding to regain full strength and alignment of the fractured edges.

A mechanical inlay restoration method of major fractured areas was selected for use where metal was not broken into small pieces and direction of fracture was nearly perpendicular to the surface.

That portion of the rib inside the frame could only be repaired by removing a window from an outer panel. This window was then replaced and repaired by the same method of mechanical "stitches."

The Easiest Method

The mechanical inlay repair method was selected for these reasons:

1—It would have been impractical to braze-weld the entire section because of difficulty in maintaining proper preheat;

2—There were not enough competent braze-weldors available to tackle the bigger job;

3—Men would have been unable to work efficiently under intense heat conditions resulting from a preheat of the entire section;

4—Braze-welding the whole section would have caused shrinkage which would, in turn, create stresses or fractures in other frame sections.

In addition to the "sutures" laid across the line of fracture, over 1,000,000 lb of strength were gained by inlaying two 5-in. by 2-in. by 20-in. steel slabs on opposite corners of the bearing chuck to redistribute high

WHERE fractures were clean-cut and extended perpendicular to surface, inlaid mechanical stitches were used as binders.

COMPLETED braze-welding repair of bearing chuck prior to hand-finishing of all machined surfaces. Inlaid steel slabs gave bearing chuck additional 1,000,000 lb of strength.

stress concentrations at these points.

Two weldors from an associated firm, Industrial Welding and Brazing Co., Lansing, Mich., augmented the three-man crew already on the job. This work force operated in shifts of three weldors using three torches at all times.

About 400 lb of 3/8-in.-diameter Tobin Bronze welding rod was used to complete the job in 12 hours of continuous braze-welding. Number 12 and 15 tips were used on the three torches.

Welding Preparations

The iron casting of the engine was prepared for braze-welding by chipping to provide a sufficient gap for torch manipulation. All surfaces were chipped smooth to eliminate ragged edges which would cause local overheating.

Vees were made from the top of the break or from the broken section to prevent overhead tinning. An air hammer and chisel were used for chipping to close the pores of the cast iron, increasing heat absorption to a depth sufficient for good bonding without getting surface grain too hot for tinning.

All vees had a lapped-over surface about 2 in. wide and ½ in. deep on each side. The width added additional strength to the area of the break by a 3/8 or ½-in. buildup on each side of the vee.

The broken cast iron piece from the top of the bearing chuck was positioned and clamped prior to preheating. A crude steel box was built to surround one side of the bearing chuck and extend 3 ft in all directions beyond the section to be welded.

This box provided space for a 12-in.-thick hardwood charcoal bed around the frame. A fire, lighted at midnight, was controlled by air blasting or damping with asbestos paper to control preheat temperatures evenly at 1,300 to 1,500 F.

Braze-welding was begun at 8 a.m. on the broken edges opposite the major break. Local preheat was made with torches, and the work was completed in two hours. During this time, the larger section was kept at preheat temperatures.

Expansion Control

Up to this time, only preparatory work for repairing the remaining fractures was done. The fractures, therefore, were still open and the adjacent casting was free to move with temperature expansion. Repair was planned in this way to provide "free end" conditions and to avoid the possibility of residual shrinkage stress in the main frame section.

Tobin Bronze was chosen for the job because of its flow and freezing characteristics which make it easy to handle when welding vertically. The molten metal pool freezes rapidly at the edges, enabling the torch operator to build a vertical wall with a reasonably straight edge.

Tinning and physical properties of this alloy were thought to be equal to or better than comparative grades of other braze-welding materials.

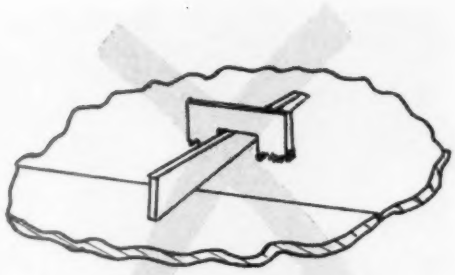
As braze-welding of the larger section progressed, the fire box was cut away to provide easier access. Hot areas facing the weldors were covered with heavy asbestos to reduce reflected heat.

Weld Completion

When welding had been completed, the fire box was covered. Charcoal was allowed to burn out, leaving the casting to cool slowly and naturally.

When the casting had cooled to room temperature, the balance of the fractured area was repaired by the mechanical inlay method, and all welded areas were then chipped and hand-dressed. Total repair of the frame required approximately 700 man-hours.

Since the braze-welded repair of this blooming mill engine, the frame has been inspected several times. Three spindle coupling boxes have failed in the meantime due to minor rolling accidents, but their failure caused no movement or looseness in the braze-welded area. There seems to be little doubt, therefore, that this frame has been restored to its original strength.



No more "dogs"

By a Staff Member

MAGNETS are being put to new uses in the welding field! For years, electromagnets have been used for plate-lifting purposes, but now the same principle is being employed to pull plate edges into alignment.

These magnets operate on 120 or 220 volts, a-c or d-c, and come in models capable of exerting up to 6,500 lb pull. They are portable, weighing up to 80 lb.

Time-saving is the prime factor in selection of the magnetic clamp as an aid in the welding shop. In fact, it becomes a multi-purpose tool in many welding applications.

Aligning Plate Edges

While not expressly designed for the purpose, the first use of the magnetic clamp is often that of a lifting magnet to bring plate stock into the welding area. Then, by careful jockeying of the plates, edges are brought together for alignment during welding.

It is on the aligning job that time is really saved. No longer is it necessary to weld "dogs" on the plates and then force them into alignment by driving wedges under the dogs.

A magnetic clamp also eliminates the necessity of removing dogs by flame-cutting, followed by a grinding (or possibly a welding and grinding) operation to return the plate to its original smoothness.

Clamping Curves

Magnetic clamps, while easily visualized for aligning flat plates, work quite satisfactorily on curved plates. In the fabrication of tanks and pressure vessels they are particularly useful, and probably offer their greatest time-saving possibilities.

By means of a lever arm attached to the clamp, plates are forced into position for tack welding. After both ends of the joint have been tacked, plate edges are held together and in alignment by a clamp energized on both plate edges.

When distorted edges of flat plates are to be welded, the edges may be forced into place by means of the lever arm or a jack screw. Even the most difficult jobs can be held in place since the magnetic coils are designed for a duty cycle of four hours on and one hour off to eliminate the possibility of having to shut down a welding operation due to overheating of the coil.

—Courtesy Portomag, Inc.

PORTABLE magnetic clamp is energized to one plate and jack screw brings opposite plate edge into alignment.

PRESSURE bar attached to magnetic clamp holds plate edges in alignment for tack welding operation. This unit exerts 3,000 lb of direct pulling strength.

—Photos courtesy Buck Mfg. Co.

WHEN tack welds have been made, unit is energized across both plate edges so weldor can complete seam.

Flame processes fabricate and protect oil well drill bits

By W. B. Noble
Vice President, Engineering
Reed Roller Bit Co.
Houston, Texas

POSSIBLY the most interesting and least understood of all oil well drilling tools is the rock bit.

The fundamental and most confining of all considerations in the design of any rock bit—or in its flame-cut and hardfaced fabrication—is simply one of space or room.

Every part of the bit that digs a hole must be contained inside the diameter of the hole . . . a fact that can be contrasted with the problems of a dragline designer.

If this designer finds that one shaft of a dragline is too small, or that key-ways are battering out, he can increase size because he has the room in which to operate.

But if performance records indicate that a design change is necessary to strengthen a component part of a rock bit, the designer must deal with limited space.

Proper Balance Adds Life

Space consideration is important not only in geometry of the bit, but also in respect to inside construction. Tooth depth, shell thickness, bearing diameter and journal diameter must be exactly right for the job to be done.

After an approved design has been sketched, materials are selected. This selection, and the heat-treating operation which follows, must be done on an individual-part basis in cooperation with the metallurgical department.

Well-designed bits fail only when inherent physical properties of steel selected do not match service requirements.

Methods of Fabrication

An oxyacetylene flame-cutting machine is used wherever possible to fabricate parts. Those pieces which need no machining after forming are therefore produced quite economically.

Tungsten carbide is a favored hardfacing substance which is applied after parts have been flame-cut. The material is "sweated" onto some parts by an oxyacetylene torch, and onto others by the atomic-hydrogen torch.

In the former method, a thin coating of water glass painted on the rock bit tooth holds tungsten carbide granules in place. Parts are then treated by an oxyacetylene torch operator, who applies sufficient heat to cause granules to sink into the surface of the tooth.

A carburizing flame is used in this operation to avoid overheating tungsten carbide granules. Torch tip size may vary from No. 7 to 11, depending upon thickness of the part and skill of the operator.

The operator of the atomic-hydrogen torch follows this same procedure but, with proper settings, can produce a similar part at less cost.

Skill of the operator is again the determining factor, but 3/32-in. electrodes and current settings between 30 and 70 amp generally are used.

Hardfaced Tool Joints

For the past twenty years, there has been an ever-increasing demand for tool joints with outside diameters protected by wear-resistant rings of tungsten carbide. Reed has been applying these rings by two methods.

The first is a "sweating-on" operation similar to that used on the rock bits. Also used is an application of a band of tube metal. This method is referred to as *deep penetration.*

A tube holding tungsten carbide granules is manually fed into the flame of an oxyacetylene torch. As the tube metal melts, it adheres to the joint being hardfaced and forms a matrix to hold the tungsten carbide. This application is usually about $\frac{1}{8}$ in. thick.

Drag Bits Protected

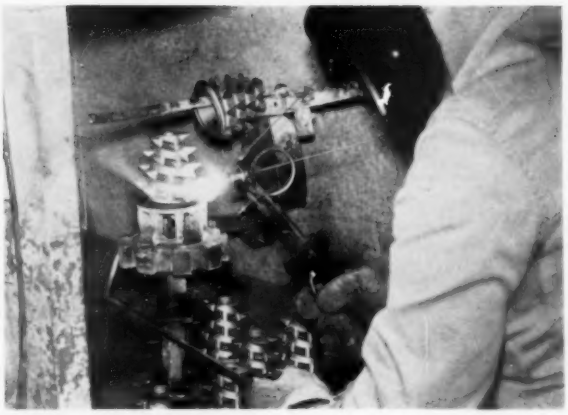
Inserts of tungsten carbide are used to increase the service life of drag or scrape-type bits. Grooves machined on the blade edges of these drag bits, as well as recesses forged on blade faces, hold the inserts.

The tungsten carbide is then covered with an overlay of tube metal. This method of hardfacing a tool that receives very rough usage has proven its value in adding thousands of feet of service life to many drag bits.

These examples of the fabrication and hardfacing of three different types of oil well drilling tools indicate that without oxyacetylene welding and flame-cutting processes Reed's manufacturing operations undoubtedly would be forced to take a backward step.

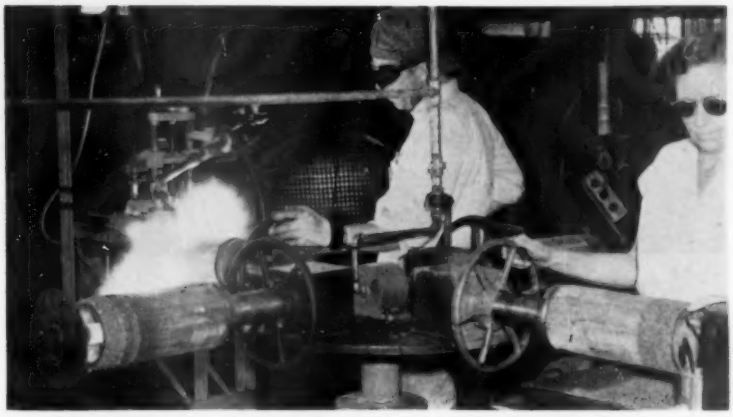
This article is based on a paper presented by the author before a meeting of the International Acetylene Association.

HEEL teeth of two-cutter, top-hole rock bits are simultaneously flame-cut to finished dimensions. Elimination of final machining effects great savings in the manufacture of these parts.



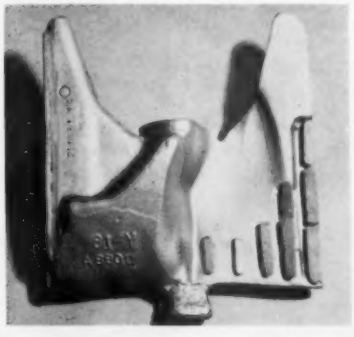
ATOMIC-hydrogen torch finds valued use in applying tungsten carbide hardfacing material to rock bit tooth. Operator here uses 3/32-in. electrodes to perform economical operation.

TUBE tungsten carbide is sweated onto tool joint by oxyacetylene torch. Tube metal forms matrix which holds hardfacing material. This application is usually 1/8 in. deep.



INDEXING fixture holds four tool joints for hardfacing application. Water glass is painted on joints to hold tungsten carbide granules. Multi-torch unit fuses material to joints.

DRAG bit has groove and recesses in blade edge and face to hold tungsten carbide inserts.

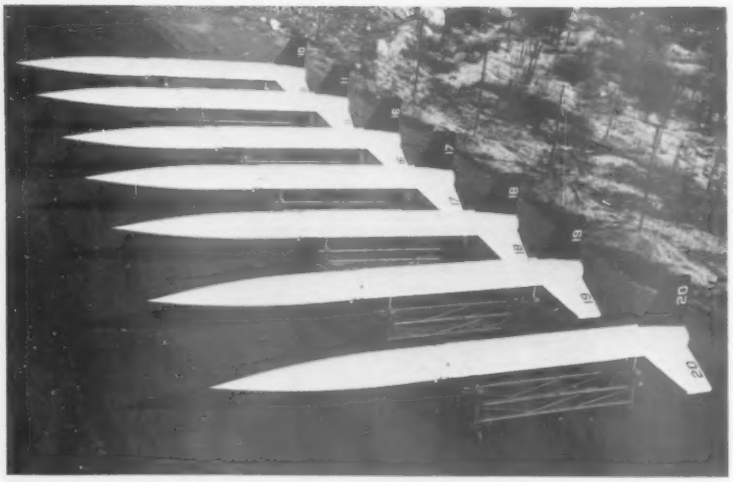


INSERTS are laid in place along one edge of drag bit. Blade at left also will be hardfaced.

OVERLAY of tube metal, applied by oxyacetylene torch, covers inserts and drag bit is ready for use.

New techniques required

Welding shows adaptability in rocket fabrication



COMPLETED Aerobee sounding rockets illustrate sleek results gained by welding high-strength alloys in proper fixtures.

By Francis H. Stevenson
Production Engineer
Aerojet-General Corp.
Sacramento, Calif.

THE USE of uncommon metals and alloys in the rocket industry has created a new branch of welding metallurgy, necessitating the introduction of new techniques.

In the fabrication of rockets and rocket engines, welding is becoming increasingly important; only by welding is it possible to fabricate some intricate parts to meet the most exacting specifications.

Probably the greatest tonnage of stainless steels in use today are such types as 302, 304, 321 and 347. These steels are basically 18% chromium and 8% nickel; their welding characteristics are well known and their fabrication presents no special problems. Some lesser known stainless steels, however, are so new that even the producer does not know how the steel can be used.

Two of the newer types in use today in the rocket industry are 17-7PH and AC 350. Some so-called super alloys and metals also are used, among them titanium and zirconium. Special carbon steels are used to some extent, particularly AISI type 4130.

Welding Processes

Welding in rocket fabrication may be considered in two major categories: resistance welding and fusion welding. Resistance welding, particularly spot welding, is important because most of the materials used in rocket engine fabrication can be spot welded.

Procedures for spot welding commercially pure titanium are quite similar to those used to spot weld type 347 stainless. The greatest difference is the penetration of the weld nugget into sheets being spot welded, and the shorter weld time required.

For example, a spot weld was made on an 0.063-in. Ti75a titanium sheet under the following conditions: squeeze time, 20 cycles; weld time, 2 cycles; hold time, 20 cycles; net electrode force, 500 lb; transformer setting, 3; weld heat, 80%.

This weld, approximately 3/16 in. in diameter, had a shear strength of 2,200 lb. A 75-kva, 60-cycle, single-phase spot welder was used in this application, although satisfactory spot welds can be made with almost any type of machine.

Acceptable Technique

The consensus among those who have studied titanium spot welding is that a short weld time, with approximately the same electrode force as used for type 347 stainless steel, will result in acceptable spot welds in unalloyed titanium. Some titanium alloys apparently may be spot welded by the use of preheat and postheat tempering cycles in the spot welding machine. Several companies are investigating this technique.

Most of the super alloys can be spot welded by the same techniques used with type 347 stainless steel.

Spot welding type 4130 carbon steel requires higher electrode pressures, tempering of the weld in the machine and the use of pulsation

This article is based on a paper presented by the author before the Midwest Welding Conference in Chicago.

FIG. 1 — Titanium test tank was welded with standard inert-arc equipment providing wide inert-gas coverage.

FIG. 2—This simple fixture supports boss and provides chill plate for control of heat-affected area.

timing. This spot welding schedule was used for ¼-in.-section areas of 4130 carbon steel: squeeze time, 120 cycles; weld interval, 240 cycles; cool time, 25 cycles; weld heat time, 30 cycles; chill time, 120 cycles; temper time, 90 cycles; net electrode pressure, 4,100 lb.

Test Requirements

Average shear strength of these specimens was 18,851 lb for a weld diameter of approximately ¾ in. This particular weld must be tempered in the machine, and this treatment results in a tensile strength of 6,213 lb and a tensile-shear ratio of 32.9%. A minimum ratio of 25% is required by military specifications.

Military specifications require that shear and tensile specimens be made and tested at least every hour for quality control. Because this method of testing can be expensive, Aerojet-General uses a "brush welding analyzer" to check control panel operation of the spot welding machine. Specimens need only be tested a minimum of two times during any 8-hour shift.

The welding analyzer uses an oscillograph; therefore, a record can be kept of welder performance. An analyzer is connected to the machine and a reading can be taken at any time.

Inert-Arc for Titanium

At the present time, titanium can be welded only by the inert-gas-shielded welding process. A small test tank (Fig. 1), fabricated from Ti75A titanium, was welded with standard equipment. Precautions, however, were taken that proper shielding was provided at the time of welding, including inert-gas protection of the underside.

The gas cup on the torch was approximately ¾ in. in diameter, providing a larger coverage of inert gas than is normally used for stainless steel.

Since fabrication of this test tank, more weldable titanium alloys have been developed, such as A-110AT and R.S.-110BX. Both of these alloys can be successfully welded and are being used for lightweight pressure vessels. The same shielding precautions must be taken as when welding unalloyed titanium.

Wide Use of Stainless

Stainless steel type 17-7PH is used fairly widely in the rocket industry. This type of steel can be heat-treated and it does not contain critical elements.

Certain welding precautions must be taken, however. The material must be cleaned either by pickling or by mechanical means; even finger marks can leave enough dirt on a welding surface to cause porosity.

Proper underside protection must be supplied—either with an inert gas or flux. With materials as thin as 0.020 in., underside backup may be a copper bar without a groove.

A short arc not more than 1/16 in. long must be held. Type 17-7PH stainless is very notch-sensitive, and precautions should be taken to eliminate any procedure that will cause a notch.

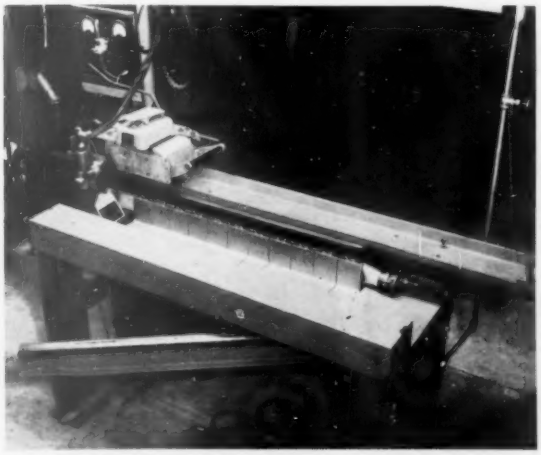


FIG. 3—Fixture will hold flat sheet or conical and circular shapes for seam welds.

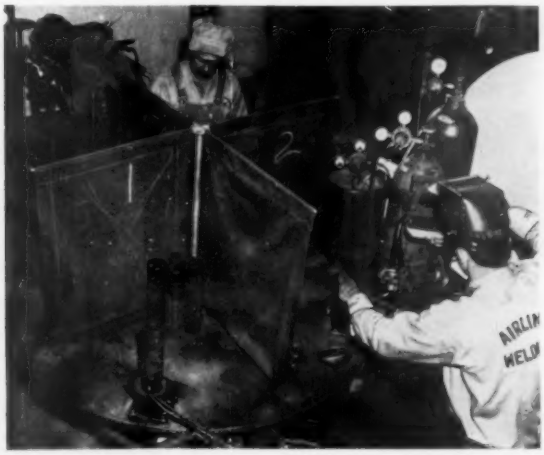
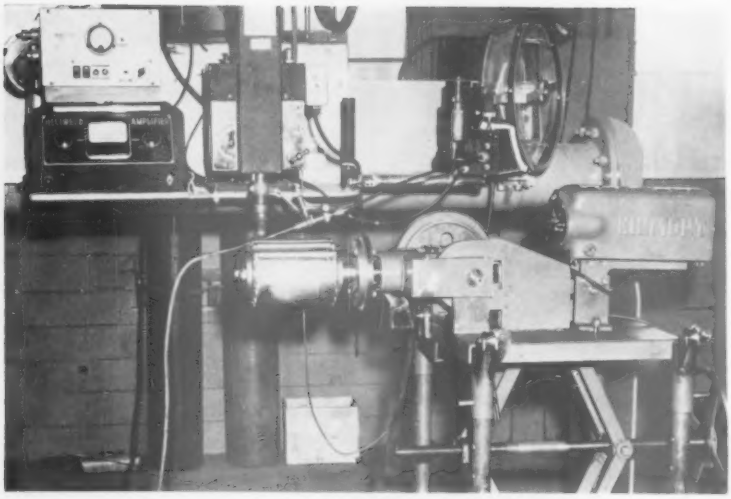


FIG. 4—Four-station fixtures allows for preheating and for two welding applications.



FIXTURES mounted on rolling tables can be loaded and moved into position under automatic Tig unit which moves on boom for longitudinal welds.

Proper Current

Welding with direct current has the advantage of localizing heat-affected zones and facilitating penetration; however, a-c has been used quite successfully for welding thin sections of 17-7PH.

At Aerojet-General, helium is used as a protection for the underside and a mixture of 75% helium and 25% argon is used at the arc. This combination seems to produce a cleaner weld puddle, and less current is required when making the weld.

Although most fusion welding performed at Aerojet-General is done with the inert-gas-shielded arc, other welding processes also are used. Much of the welding done on type 4130 carbon steel is made by the submerged-arc method.

Lower Preheat

Contrary to most recommended practices, a high preheat temperature is not used. In general, the average preheat temperature is between 250 and 300 F, with cooling in a draft-free area.

When a longitudinal seam in ¼-in. plate is welded, a square butt joint is used with a copper bar on the underside to control fall-through. The copper bar is mounted on heavy steel pipe through which hot oil is circulated to provide necessary preheat temperature.

The weld is made with a machine setting of 35 volts, 630 amp, and travel speed is 28 ipm. A ⅛-in. filler wire and a d-c generator are used.

Special Tooling

In order to produce quality welds to the tolerances now required in the rocket industry, special tooling is required. Fig. 2 shows a simple, inexpensive and effective fixture used to provide a chill plate to control the heat-affected area and, at the same time, to support the boss. The underside of the weld may be easily protected.

Fig. 3 shows a fixture used for welding longitudinal seams in flat sheet, and on circular and conical shapes. The fixture is open so that a cylinder or cone may be removed after welding.

If a fixture of this type is built for an experimental shop, the underside bar should be removable; a different bar may be needed for different jobs. Whether the fixture is used for experimental work or for production, a means of chilling or heating the bar should be provided.

Four-Station Fixture

The principal difference between back-up bars is width and depth of the groove and its curvature, should the bar be used either for flat sheets or for cylindrical shapes. The bar is one of the most important parts of the fixture because it controls depth and contour of weld penetration as well as rate of cooling.

Fig. 4 shows a welding fixture with several stations. Preheating is done at station 1; as the weldor makes his welds at station 2, the part is being rotated under the preheating torch. Station 3 is for unloading and loading, and station 4 is for another welding operation.

Two welding processes are used in fabricating the part. An inert-gas-shielded process is used at station 4, and the submerged-arc process is used at Station 2. This fixture is fully automatic and timed to the welding operation.

Fixtures for spot welding should be made of non-magnetic materials when possible, particularly when part of the fixture must be in the throat of the machine during welding. If a magnetic material such as a carbon steel is used, an induction current is set up in the fixture which reduces available heat for spot welding.

This, in turn, makes it necessary to boost the current supplied to electrodes, and places an unnecessary load on the spot welder. A magnetic material should be used only when absolutely necessary.

Fixture Design

The criteria for designing a fixture may be summarized as follows:

1. *Accessibility:* This is of prime importance if a good job is expected from the operator.

2. *The use of quick-acting clamps instead of screws:* The fixture can thus be loaded and unloaded with minimum labor time.

3. *Allowance for shrinkage:* In general, uniformity of welding procedure is the best way to control shrinkage; this applies to manual as well as automatic welding. However, fixtures may be shimmed at part pick-up points to permit easy determination of the best final location by empirical means.

To produce high quality welds used in today's rocket engines, the following preparations are necessary:

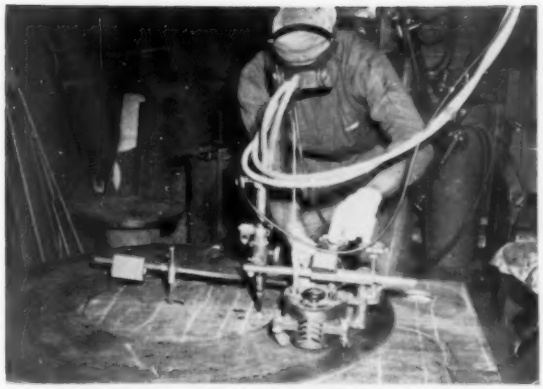
(a) Cooperatively plan and design the weld with the parts designer;

(b) Design the part for material, process, equipment and welding techniques to be used;

(c) Provide equipment and tooling with required productive capacity and service life;

(d) Control and maintain welding operations so that welds of specified quality are consistently made.

That big step from manual to semi-automatic flame-cutting



THIS circular flame-cutting unit—plus manual torches—comprised Chicago Pump Co.'s cutting dept. until purchase of semi-automatic unit shown below.

By a Staff Member

THESE case histories, gathered from visits to two Midwestern manufacturing plants, seem to indicate that, when semi-automatic flame-cutting operations are economically desirable, a well-thought-out installation can bring about many favorable results and full returns on expenditures.

Until Chicago Pump Co. took the big step and found out, in a practical way, just what they had been missing, the advantages to be gained in a production changeover from manual to semi-automatic flame-cutting operations were purely theoretical.

Using a small, circular flame-cutting machine, and augmenting its obviously limited operations with tedious and time-consuming hand cutting, the firm was forced to purchase many parts that had already been cut by an outside supplier.

Often, they had to settle for brittle castings in lieu of the hot rolled steel components they desired. These components constitute all of the parts to be found in the firm's line of industrial pumps, which are used principally in sewage disposal.

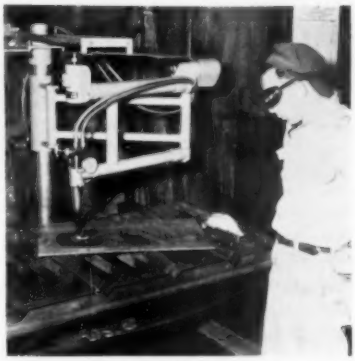
Some "Plus" Advantages

After a thorough check of available machines, the company purchased a semi-automatic oxyacetylene flame-cutter that not only provided an answer to all its major problems, but eliminated other costly factors that had not been seriously considered.

The wealth and variety of work performed by the new machine is indicated by the great number of templates—over 200—with which the flame-cutter can trace its operation. Hand-cutting, obviously, is now held to a minimum.

Gas Consumption

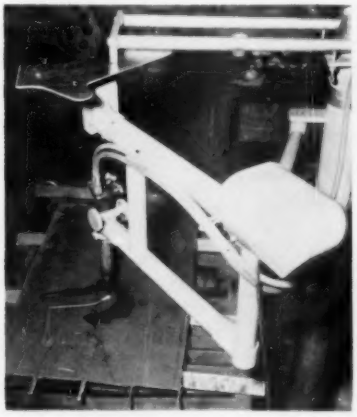
A cutting speed of approximately 30 in. per minute on $\frac{5}{8}$-in. stock has been logged. This speed naturally varies with other plate thicknesses. A range in plate thickness from $\frac{1}{8}$ to $1\frac{1}{2}$ in. is normally encountered in everyday operations.



Cutting tips in drill sizes 62 to 46 are used, with the emphasis on the smaller orifices. Kerf has presented no problem, and only a light finishing is necessary before flame-cut parts proceed to the next step in the company's assembly line.

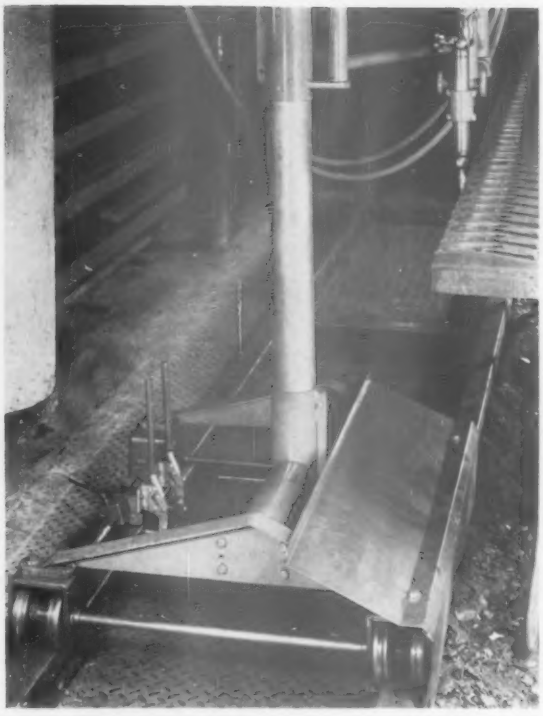
Further economical aspects in the

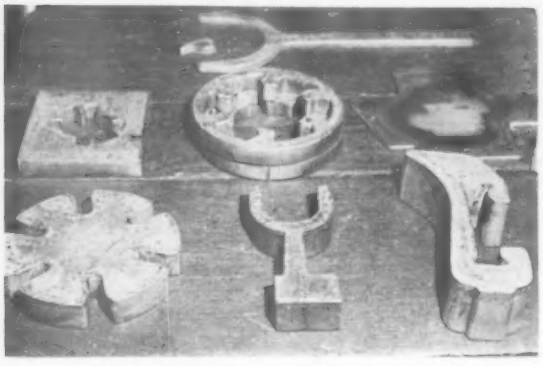
MORE than 200 templates used by Chicago Pump hang on the wall . . .



. . . until needed to help new unit trace a cut in steel plate.

FLAME-cut parts are then are welded to form large pump component.





OLIVER Machinery Co. can quickly cut shapes like those below with mobile flame-cutting machine shown at left. Chipbreaker toes for woodworking machinery (shown at bottom right in photo below) are being flame-cut in this application. Note levers for indexing machine on track.

operation of this automatic flame-cutter are indicated in a comparison of gas consumption and productivity. Three 220-cu-ft tanks of oxygen and one 320-cu-ft tank of acetylene are consumed in the course of an average week—only slightly more than with the old system.

Shop personnel estimate, however, that *production speeds have been increased by 75 to 200%!*

On top of this, greater accuracy is maintained in the automatic process. On short cuts, a tolerance of 1/64 in. is obtained. Similar accuracy is not unusual even on cuts of more than 6 ft, where the margin of error is as little as 1/16 in.

The compact automatic unit fits neatly into a corner of the shop and templates are hung on a wall—thus solving a pressing space problem—and a single operator now takes the place of three manual cutters.

Suitable Refinements

Take a relatively inexpensive flame-cutting machine, add a few refinements to suit your particular needs, and you might have a money-saver.

That is what Ernst Duesing, foreman at Oliver Machinery Co., Grand Rapids, Mich., did, and those refinements helped him sell to higher management another phase of his continuing process (sometimes battle) to switch from castings to weldments.

Oliver manufactures woodworking and food-wrapping machinery. In the past, most of the parts for various types of these machines were cast, then machined. Duesing, however, has seen to it that many are now weldments or flame-cut individual pieces.

His job of selling flame-cutting and welding was no easy task, for Oliver also owns its own foundry and castings were not so expensive as they might otherwise be. But Foreman Duesing, who has won two cash awards in the James F. Lincoln Arc Welding Foundation competition, convinced his superiors that weldments are cheaper, give better service, have superior appearance and are easier to finish than castings.

Mobile Cutter

The refinements mentioned above consist of a track and carriage by which the flame-cutting machine becomes more or less mobile. Another feature is an indexing device consisting of two levers that lock the machine on the track at a selected point.

This mobility has enabled faster cutting with less handling of the steel plate. The specific machine depicted in the photograph accompanying this article is used to cut parts for all machine types made by Oliver's Packaging Division.

The part being flame-cut in the photo is a chipbreaker toe for woodworking machinery. A series of these toes is used as guides to hold down a board in a planing machine, insuring uniform thickness. The toe also prevents the board from "kicking back."

Besides the machine pictured, Duesing's department uses another contour-cutting machine, two straight-line cutting machines and several hand torches.

Welding Also Used

All welding processes, as well as brazing and soldering, are also carried on in this Oliver division. Repairing castings for the foundry is another function of the welding processes employed by Oliver. About 90% of casting repair is accomplished by the arc process, using nickel-alloy electrodes.

Oliver uses a mixture of oxygen and propane as the cutting fuel for its flame-cutting machines, although acetylene is still used in hand torches for cutting shapes which the automatic devices cannot handle.

Duesing feels that for Oliver's specific applications, the advantages of propane outweigh those of acetylene.

AND away we go! With a pretty assistant standing by, new AWS President J. J. (Jack) Chyle flame-cuts heavy steel chain to signify opening of Welding Show in Buffalo auditorium.

AWS in Buffalo:

New equipment, new information, new records!

By Jack Fairlie

WITH SOME of the impact of a modern-day AEF, the American Welding Society swept into Buffalo, N. Y., early in May to conduct its annual spring meeting and Welding Show.

The Hotel Statler and other hostelries bulged with the meeting's 1,600 registrants, while the city's Memorial Auditorium received a virtual overflow crowd of 8,050 registrants. Opening day (May 9) registration at the Welding Show totalled 4,609, compared to a three-day registration of 7,800 when the show was last held in Buffalo in 1954.

A total clocked attendance of approximately 12,000 visitors and exhibitors viewed the auditorium's million-dollar display of welding equipment and supplies.

21 Technical Sessions

With an initial slate of 63 technical papers to be read in the short space of five days—May 7 to 11—it was a case of working against the clock for speakers and listeners alike. Beginning on Monday afternoon and ending Friday morning, three simultaneous sessions were held morning and afternoon until all papers had been presented.

Four of the 21 technical sessions were co-sponsored by the metals engineering division of ASME. The welding committee of the Atomic Energy Commission joined with AWS to co-sponsor one session on welding nuclear reactor components.

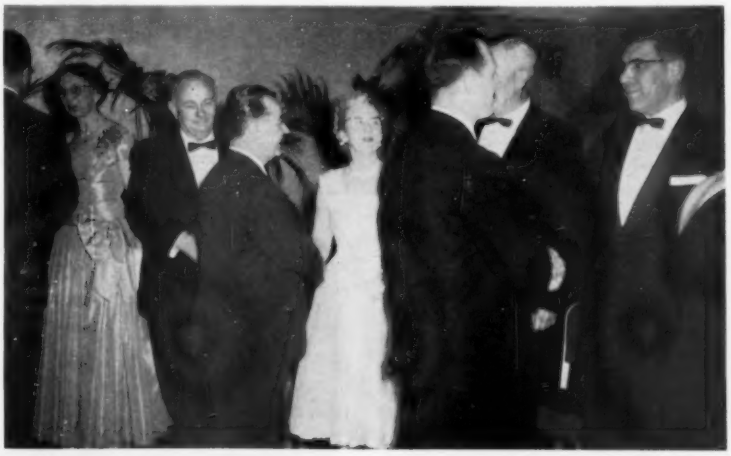
Opening the spring meeting on Monday morning, J. H. Humberstone, the Society's outgoing president, told a large group of members that "optimism is not enough."

A constructive, confident attitude toward the attributes and possible applications of welding processes was the goal toward which Mr. Humberstone directed his remarks. "It's the negative approach that is doing great harm," he said. "We must be a militant crusading force preaching and practicing the gospel of better welding for better, more economical, more practical product fabrication."

New Officers

Following Mr. Humberstone at this opening session was Dr. J. W. Barker, president of ASME. He told his audience that engineers are being lost through death or retirement faster than they are being replaced by engineering school graduates.

Dr. Barker called upon engineers



GREETING line at President's Reception in Hotel Statler includes (left to right) Mrs. J. Chyle, wife of new AWS president; Clarence P. Sander, newly-elected first vice-president; Mrs. Sander (greeting Frank Iapalucci, Baldwin-Lima-Hamilton Corp.) and J. H. Humberstone, outgoing Society president.

CAUGHT in the middle of this exchange between Gus Emin of Bridgeport Brass Co. (left) and Fred Jessar, Aljay Mfg. Co. (right), is William Cherry, secretary of Canadian Welding Society.

BUSY booth—one of many at the Welding Show—is this one displaying the products of Ampco Metal, Inc., Milwaukee. Approximately 12,000 visitors witnessed 3-day exhibit.

"not only as engineers, but as citizens," to take an active role in fostering good educational practices in their communities.

John J. Chyle, newly-elected president of AWS, presented the digest of scheduled technical papers. Director of welding research at A. O. Smith Corp., Milwaukee, Mr. Chyle is a former director of the Society (1948-51), a Samuel Wylie Miller Medalist (1955), and first vice-president during the term 1955-56. He assumed the office of president on June 1.

Also elected to office for the 1956-57 term were Clarence P. Sander, Consolidated Western Steel Div., U. S. Steel Co., Vernon, Calif., who will serve as first vice-president, and Gustav O. Hoglund, Alcoa Process Development Laboratory, New Kensington, Pa., second vice-president. *(For the names of new directors-at-large and district directors, see* WELDING ENGINEER, *May, p. 38).*

Diversified Subjects

The papers, which were grouped by two's, three's and four's in each technical session, covered a range of topics that included weld testing, brazing and soldering, welding dissimilar metals, resistance welding, gas-shielded welding and many others.

Each technical session was presided over by a chairman, vice-chairman and supervisor. A question-and-answer period was allowed when speakers completed their presentations, and at times these brief exchanges were spiced by thought-provoking exceptions to the speakers' theses.

The contributions of a large segment of the welding industry were adequately represented in two papers presented during the session co-sponsored by the welding committee of AEC on Tuesday morning, May 8.

Topics of the papers were, "Fabrication of homogeneous reactor test vessel assembly," and "Fusion welding zirconium for a nuclear reactor." Session Chairman F. W. Davis of the Atomic Energy Commission told his audience that a third scheduled paper, "Sodium corrosion and oxidation resistance of high-temperature brazing alloys," had to be withdrawn for security reasons.

Safety in Welding

In a Wednesday afternoon session on welding and cutting processes, J. B. Jones of Aeroprojects, Inc., and J. J. Powers, Jr., of Frankford Arsenal presented a much-talked-about paper on ultrasonic welding. The authors described the achievement of solid state bonding of similar and dissimilar metals by elastic vibratory energy in the joint area.

Four papers, two of which were related, were presented under the heading of "Safety, health and fire prevention." H. F. Reinhard of Union Carbide & Carbon Corp., vice-chairman of this session, told visitors that comprehensive welding safety standards have opened the way to final elimination of all hazards.

"We have the know-how," he said. "The information now must be properly disseminated, and management must see to it that regulations are enforced."

Stressing a common-sensical approach to potential hazards, Dr. B. L. Vosburgh of General Electric Co. led off the session with a paper on "Health aspects of welding," which he co-authored with J. J. Ferry, also of G-E. Following Dr. Vosburgh was B. F. Postman of Employers Mutual Liability Insurance Co. Mr. Postman covered many important aspects of "Safety in installation and use of welding equipment."

"Fire prevention" was the topic chosen by E. R. Wallace of Eastman Kodak Co. Mr. Wallace traced the development of Eastman's safe welding practices code following a disastrous fire at the firm's Rochester, N. Y., plant.

Two representatives of General Motors Corp., R. L. Snyders of GM Institute and L. J. Rose of Fisher Body Div., presented development and application aspects of "A plant program for plant safety and efficiency."

Special Awards

Presented for the first time at the Buffalo meeting were Meritorious Certificate Awards. These awards were made on the basis of outstanding work done by members either on a national or a district basis.

Isadore Morrison, vice president in charge of manufacturing, Morrison Steel Products, Inc., Buffalo, and J. H. Blankenbuehler, design engineer for Hobart Brothers Co., Troy, Ohio, received the national awards.

Recipients of district awards were J. W. Mortimer, Hartford, Conn.; Bela Ronay, Annapolis, Md.; Dr. Robert Stout, Bethlehem, Pa.; R. D. Thomas, Jr., Philadelphia; J. F. Minotte, Pittsburgh; Thomas R. Berg, Miami, Fla.; H. B. Cary, Marion, Ohio; R. J. Yarrow, Lyndhurst, Ohio; J. R. Stitt, Detroit; C. O. Dreutzler, Beloit, Wis.; L. S. McPhee, Harvey, Ill.; J. E. Dato, New York

City; H. N. Simms, Oklahoma City; P. V. Pennybacker, Austin, Tex., and R. L. Davenport, Long Beach, Calif.

Some Conferences

Offered as a special adjunct to the Society's spring meeting and Welding Show were two conferences: one designed for students interested in welding, and another tailored to fit the needs of production executives seeking information on the practical aspects of factory welding.

High school and university students from Buffalo and six other Niagara Frontier cities were invited to late-afternoon lectures at the auditorium on Thursday and Friday, May 10-11. Those attending the lectures also were given permission to inspect exhibits at the Welding Show.

From Far Places

Although representatives from nearly all of the 48 states comprised the largest precentage of show visitors, there were many Canadians on hand from Toronto, Hamilton, Windsor and other major cities.

This largest of all welding shows obviously attracted some overseas notice, too. Visiting WELDING ENGINEER's display booth at the auditorium were Andre LaGrange of Brussels, Belgium, and A. Bromberg of Tel Aviv, Israel. On a flying visit from Paris, with the express intent of viewing the welding equipment displays, were Jean Peronnin and Leon Guillon of La Soudure Electrique Languepin.

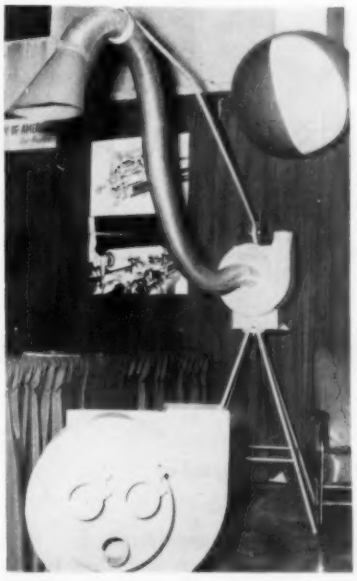
Mr. Peronnin is director of production for the firm, and Mr. Guillon is chief of the electrical department.

Next in line for the AWS is the national fall technical meeting, scheduled for October 8-12 in Cleveland. This meeting will be held concurrently with the National Metal Exposition and Congress, which will hold its display in Cleveland's Public Auditorium.

The October get-together will be the last time at which an AWS meeting will be held in conjunction with the National Metal Exposition. It will also be the last fall meting of the Society.

NO ONE—but no one!—walked a straight line past Cayuga Machine & Fabricating Co.'s booth. The reason is tall, shapely and altogether obvious.

PHOTO display of Webb Corp.'s equipment line, plus live exhibit of automatic welding equipment, brought a steady stream of visitors to the booth.



ONE of the most unusual displays at the show was this dust and fume collector exhibited by Engwald Corp. Intermittently exhausted air kept large ball floating in the air.

SCALE model of welding positioner holds the attention of one visitor to Aronson Machine Co. booth, while company representative talks with another.

VISITING the U. S. from Tel Aviv, Israel, A. Bromberg stopped to talk with representatives of WELDING ENGINEER at auditorium booth.

The Editors of WELDING ENGINEER queried large users of stainless Types 201 and 202 on the weldability of these relatively new, low-nickel steels. The Budd Co.'s answer was typical: "Types 201 and 202 fit completely into the standard table of AWS-recommended practice for resistance welding 300-series stainless. Budd uses the same design strengths and welding practices for 201 and 202 as it does for stainless types 301 and 302."

Here is confirmation of this practice, as uncovered by a producer, Allegheny Ludlum Steel Corp., during extensive welding tests on the new steel types.

300-series stainless steel was used for side panels in new Taglo train manufactured for Rock Island Railroad by ACF Industries, Berwick, Pa. One of the new 200-series stainless types could be used under almost identical conditions, and give comparable strength and corrosion resistance.

Uses expand as 200-series stainless passes weldability tests

By a Staff Member

RECENTLY standardized by the American Iron and Steel Institute, stainless steel types 201 and 202 currently are undergoing extensive tests by manufacturers to determine weldability, corrosion resistance and other important usage factors.

Many fabricators, in fact, already are making wide use of this relatively new family of stainless types to meet an increasing demand for more stainless in consumer and industrial products.

Types 201 and 202 stainless are low-nickel, high-manganese, austenitic steels that provide an acceptable substitute for the high-nickel austenitic types now in short supply due to the continuing nickel shortage. They closely resemble types 301 and 302 in physical properties.

Weldability Tests

Allegheny Ludlum Steel Corp., Brackenridge, Pa., conducted welding tests on commercial heats of stainless types 201, 202, 204 and 204 ELC (extra low carbon—see Table I), and found them to be as easily welded by inert-arc and spot welding methods as the 18-8 stainless types 301, 302, 304 and 304 ELC.

A recent report issued by Allegheny Ludlum stated that sound, clean welds were easily produced in these chromium-manganese-nickel types, and that they should be readily weldable by any common method.

Physical tests of the welded material showed slightly higher tensile and yield strengths, elongation, and bend angle than in comparable welded samples of types 301, 302, 304 and 304 ELC. Types 201 and 202 sensitized during welding.

Type 204 did not show any carbide precipitation when 0.062-in. material was welded, but the report indicates that it may precipitate carbides dur-

The Allegheny Ludlum Steel Corp. report, upon which a large portion of this article is based, was prepared by R. Kaltenhauser of A-L's research laboratories.

Physical properties of

200-series stainless steels

	0.2% Yield Strength (psi)	Tensile Strength (psi)	% Elong.	% Elong. Over Weld	Bend
Type 201					
Base metal, mill annealed	52,910	116,710	56	—	180 deg.
	53,190	117,840	56	—	180 deg.
Butt fusion weld	61,350	124,850	34	54	180 deg.
	59,920	119,850	30	50	180 deg.
Butt fusion + 5 min. at 1,950F	54,450	118,900	50	50	180 deg.
	54,700	122,650	44	64	180 deg.
Type 202 filler metal	53,400	104,800	28	40	180 deg.
	54,180	104,600	29	44	180 deg.
Type 202 + 5 min. at 1,950F	53,120	104,450	27	44	180 deg.
	55,800	103,350	24	42	180 deg.
Type 308 filler metal	56,340	103,400	24	40	180 deg.
	54,680	106,600	28	40	180 deg.
Type 308 + 5 min. at 1,950F	50,550	99,320	29	48	180 deg.
	49,640	96,430	25	40	180 deg.
Type 202					
Base metal, mill annealed	50,880	107,950	55	—	180 deg.
	52,240	108,400	55	—	180 deg.
Butt fusion weld	54,530	101,000	22	38	180 deg.
	54,950	97,130	21	40	180 deg.
Butt fusion + min. at 1,950F	51,240	96,460	25	42	180 deg.
	51,720	93,870	24	40	180 deg.
Type 202 filler metal	54,210	100,700	26	42	180 deg.
	53,060	100,350	27	44	180 deg.
Type 202 + 5 min. at 1,950F	53,270	97,460	24	44	180 deg.
	50,700	96,500	26	44	180 deg.
Type 308 filler metal	54,750	97,250	22	38	180 deg.
	55,640	94,910	19	36	180 deg.
Type 308 + 5 min. at 1,950F	50,950	90,200	23	40	180 deg.
	49,230	89,500	20	36	180 deg.
Type 204					
Base metal, mill annealed	55,210	102,200	51	—	180 deg.
	56,620	105,050	50	—	180 deg.
Butt fusion weld	58,310	103,800	30	48	180 deg.
	57,290	102,960	35	48	180 deg.
Butt fusion + 5 min. at 1,950F	56,510	98,240	29	44	180 deg.
	56,690	100,880	34	44	180 deg.
Type 204 filler metal	61,720	104,720	26	38	180 deg.
	62,250	107,580	28	40	180 deg.
Type 204 + 5 min. at 1,950F	56,260	100,230	33	46	180 deg.
	59,130	101,920	26	40	180 deg.
Type 204 ELC					
Base metal, mill annealed	51,130	99,350	49	—	180 deg.
	50,160	99,036	52	—	180 deg.
Butt fusion weld	48,220	93,660	40	40	180 deg.
	48,100	91,550	38	54	180 deg.
Butt fusion + 5 min. at 1,950F	46,430	89,350	32	40	180 deg.
	45,350	91,380	34	54	180 deg.
Type 204 ELC filler metal	50,720	95,810	36	58	180 deg.
	49,730	93,920	36	54	180 deg.
Type 204 ELC + 5 min. at 1,950F	50,490	97,090	26	48	180 deg.
	50,280	95,720	31	56	180 deg.

Table I—Chemical Analysis

Type	% C	% Mn	% P	% S	% Si	% Cr	% Ni	% N	Gage
201	0.096	6.01	0.021	0.008	0.76	16.72	3.83	0.14	0.062 in.
202	.098	10.10	.015	.007	.69	17.27	4.07	.14	.062 in.
204	.066	9.32	.018	.010	.64	18.41	5.53	.24	.062 in.
204 ELC	.023	10.37	.017	.012	.56	17.36	4.97	.20	.062 in.

Table II—Welding Conditions

Type	Gage	Electrode	Atmosphere	Speed	Amp	Volts	Remarks
201	0.064 in.	0.080 W	5 cu ft A—20 cu ft He	18 ipm	125	13	Butt fusion weld
202	0.64 in.	0.080 W	5 cu ft A—20 cu ft He	18 ipm	125	13	Butt fusion weld
201	0.64 in.	0.080 W	5 cu ft A—20 cu ft He	14 ipm	110	14	Filler metal hand-fed
202	0.64 in.	0.080 W	5 cu ft A—20 cu ft He	14 ipm	110	14	Filler metal hand-fed
204	0.64 in.	0.080 W	5 cu ft A—20 cu ft He	18 imp	110	13	Butt fusion weld
204 ELC	0.64 in.	0.080 W	5 cu ft A—20 cu ft He	18 imp	110	13	Butt fusion weld
204	0.64 in.	0.080 W	5 cu ft A—20 cu ft He	14 ipm	110	13	Filler metal hand-fed
204 ELC	0.64 in.	0.080 W	5 cu ft A—20 cu ft He	14 ipm	110	13	Filler metal hand-fed

ing the welding of plate thicknesses. All of the 200 and 300-series types listed will show precipitated carbides under service conditions in the normal sensitization temperature range.

Welding Conditions

Butt fusion welds were made by A-L engineers, using all of the materials under welding conditions shown in Table II. Each heat also was welded using base metal strips and type 308 wire as filler metal.

Welding conditions were similar to those required for types 301, 302 or 304, but required slightly more heat —or slower welding speeds—per inch of weld than the 300 grades. No difficulty was encountered during welding; the materials were fluid and produced sound welds.

Spot welds were made with the four stainless types, and tension-shear test results were compared with type 302 (Table III). For corresponding welding conditions, the Cr-Mn-Ni steels produced slightly higher shear strengths than type 302.

Modified Strength

As welded, all material was bent 180 deg around a two-thickness diameter without cracking. The 115,000-psi tensile strength of type 201, when modified by the lower tensile strength (100,000 psi) of 202 filler metal, dropped to approximately 102,000 psi. The 80,000-psi type 308 filler metal lowered tensile strength to approximately 95,000 psi (see WELDING ENGINEER's Data Sheet No. 189, which is a part of this article).

The 105,000-psi tensile strength of type 202 was modified to approximately 90,000 psi by type 308 filler metal. This, of course, was due to dilution and mixing of base and filler metals in the weld.

Tensile strength, yield strength and bend angles were 90 to 100% of base metal values, while elongation over the weld was 75 to 100% of base metal values.

Samples cut across the welds by A-L testers were treated in 15% HNO_3-3% HF at 140 F to reveal any carbide areas precipitated during welding. Narrow carbide lines were noted on the 201 and 202 samples, but none were visible in the lower-carbon types 204 and 204 ELC.

Carbides Redissolved

The samples indicated that 201 and 202 materials are susceptible to sensitization during welding to about the same degree as types 301 and 302 with the same carbon content. It was found that all precipitated carbides redissolved during annealing at 1,950 F.

Types 204 and 204 ELC did not reveal any sensitization due to the relatively small amount of heat used in welding the 0.064-in. sheet thickness. Plate material, the report stated, would naturally be subjected to much more heat during welding. Suscepti-

MALT cups and many other items are being produced from type 202 stainless by Bloomfield Industries, Inc. of Chicago. Firm formerly used type 302, but switch to low-nickel stainless did not necessitate production changes. Cup body is drawn; base and handle are spot welded.

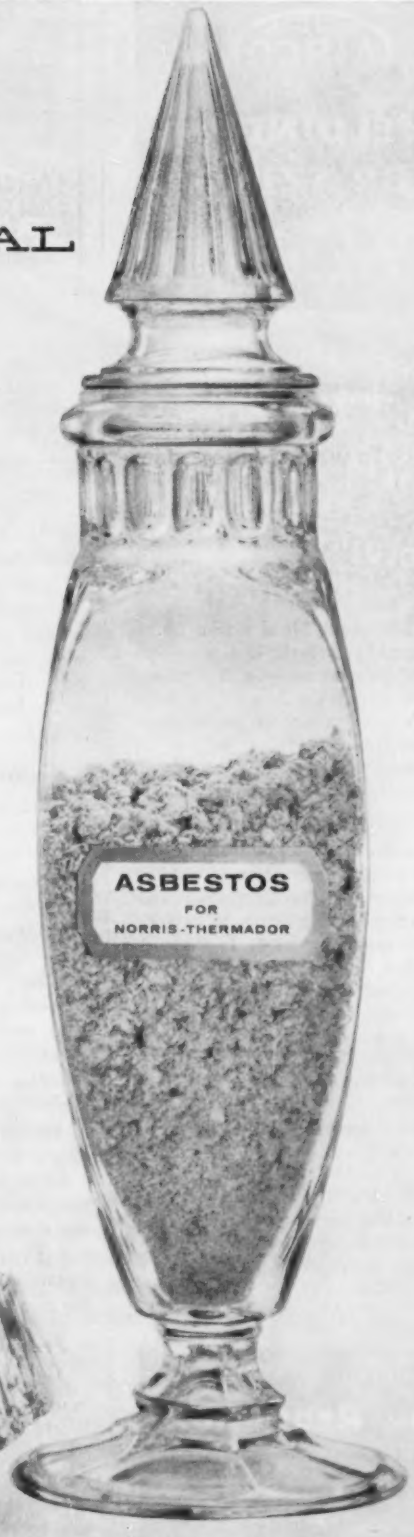
Acetylene Cylinders...

FILLED WITH PHARMACEUTICAL CERTAINTY

The business-like *exterior* of a Norris-Thermador Acetylene Cylinder is matched by an efficient, filler *interior*. One of the important contents is springy, long-fiber asbestos, specially selected for its ability to bind and strengthen the other components—charcoal, diatomaceous earth and cement. Asbestos contributes to the filler's gas capacity, lightness and uniformity. Pharmaceutical certainty at every step is just one notable reason why Norris-Thermador Acetylene Cylinders give long-lasting service.

OTHER OUTSTANDING FEATURES

Cold-drawn construction... light weight for easy handling... bases curled *under* for maximum strength and compact storage... larger cap holes... tags easily read without having to remove them... all welding X-ray controlled... specifications ICC-8 met and exceeded.



Acetylene Cylinders from 10 to 300 cubic feet capacity. Write or wire for specifications on all sizes. Cable Northerm.

SEVEN LEAGUES AHEAD

3-1080

NORRIS-THERMADOR CORPORATION

5215 SOUTH BOYLE AVENUE. LOS ANGELES 58. CALIFORNIA. DEPT. WE-656

AIRCO
WELDING and BRAZING Hints

PROBLEM:

To weld stainless steel

SOLUTION:

Airco Stainless Steel Rods. These rods are used principally in welding base metals of the same analysis. To a limited degree that may also be used for welding high strength and hardenable steels when such steels cannot be pre- or post-heated for welding. Stainless steel rods can also be used as filler metal in oxyacetylene welding.

Airco Stainless Steel Welding Flux. Due to its chemical action at welding temperatures, this flux liberates a gaseous envelope which tends to exclude the atmospheric oxygen. It thus reduces the formation of chromium oxides – adding to its superior qualities. This flux also dissolves any oxides present which would otherwise impair the welding. This same paste is ideal as a back up flux for the underside or inaccessible places that cannot be covered by inert gas for Heliwelding stainless steel.

Send for this free catalog!
You'll find here the finest rods and fluxes for joining both ferrous and non-ferrous metals. Write Airco at address below.

Request Catalog 9-131-WE

AIRCO
AIR REDUCTION
New York 17, N. Y.
Offices and dealers in most principal cities
On the west coast—
Air Reduction Pacific Company
Internationally—
Airco Company International
In Cuba—
Cuban Air Products Corporation
In Canada—
Air Reduction Canada Limited

Table III—Spot Welding Conditions

Gage	Electrode Contact Diam.	Electrode Force	Weld Time	Amp
0.064 in.	11/32 in.	1,500 lb	26 cycles	10,400
0.064 in.	11/32 in.	1,500 lb	30 cycles	10,400
0.064 in.	11/32 in.	1,500 lb	14 cycles	11,500
0.064 in.	11/32 in.	1,500 lb	18 cycles	11,500
0.064 in.	11/32 in.	1,500 lb	22 cycles	11,500

Tension-Shear Values

Amp	Weld Time	201	202	204	204 ELC	302
9,400	26 cycles	2,700 lb	2,830 lb	3,290 lb	2,670 lb	2,400 lb
9,400	30 cycles	3,050 lb	3,200 lb	3,490 lb	3,040 lb	2,280 lb
10,500	14 cycles	2,230 lb	2,090 lb	2,430 lb	2,460 lb	1,860 lb
10,500	18 cycles	2,740 lb	2,170 lb	2,820 lb	2,870 lb	2,110 lb
10,500	22 cycles	——	——	3,730 lb	2,990 lb	2,440 lb

bility to sensitization of type 204, therefore, must be evaluated for the individual application.

Examination of the microstructure of materials as welded and after annealing showed good fusion between weld and base metal. Dendritic structure of the weld and annealed areas in the heat-affected zone were normal in appearance.

Suitable Filler Metal

All materials used as filler metal reportedly diluted well with base metal. Any austenitic stainless steel, with suitable physical properties and corrosion resistance, should therefore be suitable as filler metal to weld these materials.

Welds that were not heat treated showed a response to hardening by cold working that was equal to, or greater than, that of the base metals. Samples used in bend tests became slightly magnetic after bending, indicating the transformation from austenite to martensite during working.

In all cases, welds became slightly magnetic, while only the 201 base metal became magnetic due to bending. Peening of the welds and base metals increased the hardness of all the materials.

Production Outlook

Although it has seen limited use—in differing alloy compositions—since World War II, low-nickel austenitic stainless steel is only now entering the stage of expanding usage.

During 1955, production of stainless types 201 and 202 totalled less than 2,000 tons. Producers and fabricators indicated in a recent survey, however, that substantial quantities will be consumed by many U.S. industries during 1956.

These survey replies undoubtedly were prompted by pessimistic estimates of the future availability of nickel. Austenitic stainless steels presently consume approximately 20% of total U. S. nickel production and, though nickel production is increasing, the production of stainless has risen even higher.

In view of the good welding characteristics of the new 200-series stainless uncovered by manufacturers like Allegheny Ludlum, some industry leaders have seen constantly increasing applications for the steel. They have expressed confidence that growth trends for the stainless types discussed in this article will continue through 1956, and to a point where these types will replace up to 80% of the higher-nickel types 301 and 302.

"I said—would you mind showing me what you welded?"

BETTER THAN WE EXPECTED!

RACO 120 • 16T ELECTRODES

Designed for
Welding T-1 Steel Plate

HIGH TENSILE

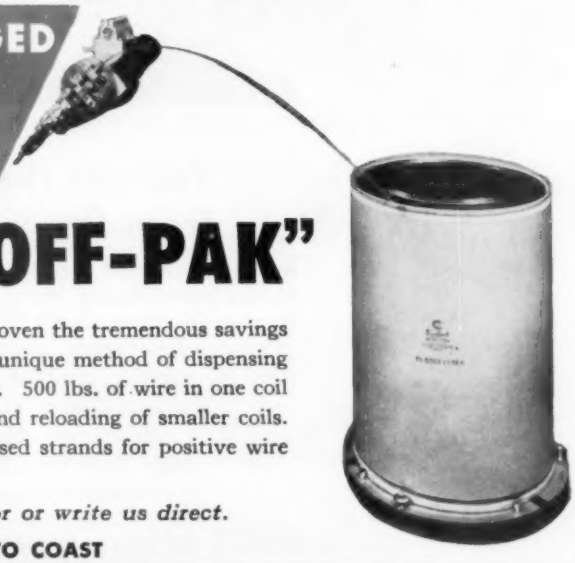
EXCELLENT ELONGATION

HIGH IMPACT

HEAT TREATABLE

Field reports have proven beyond a doubt that the new RACO 120-16T electrode for welding "T-1" steel is unsurpassed in quality. But there's only one way to find out—see for yourself. Order 120-16T's from your distributor or direct, or write for detailed description.

FOR AUTOMATIC SUBMERGED ARC WELDING AND INERT GAS WELDING



RACO "PAY-OFF-PAK"

Large industries have proven the tremendous savings realized through the use of this unique method of dispensing wire for all types of automatic welding. 500 lbs. of wire in one coil eliminates necessity of constantly changing and reloading of smaller coils. Wire stays free from kinks, bends, twists and crossed strands for positive wire feed at increased welding speeds.

For detailed information, see your distributor or write us direct.

DISTRIBUTORS FROM COAST TO COAST

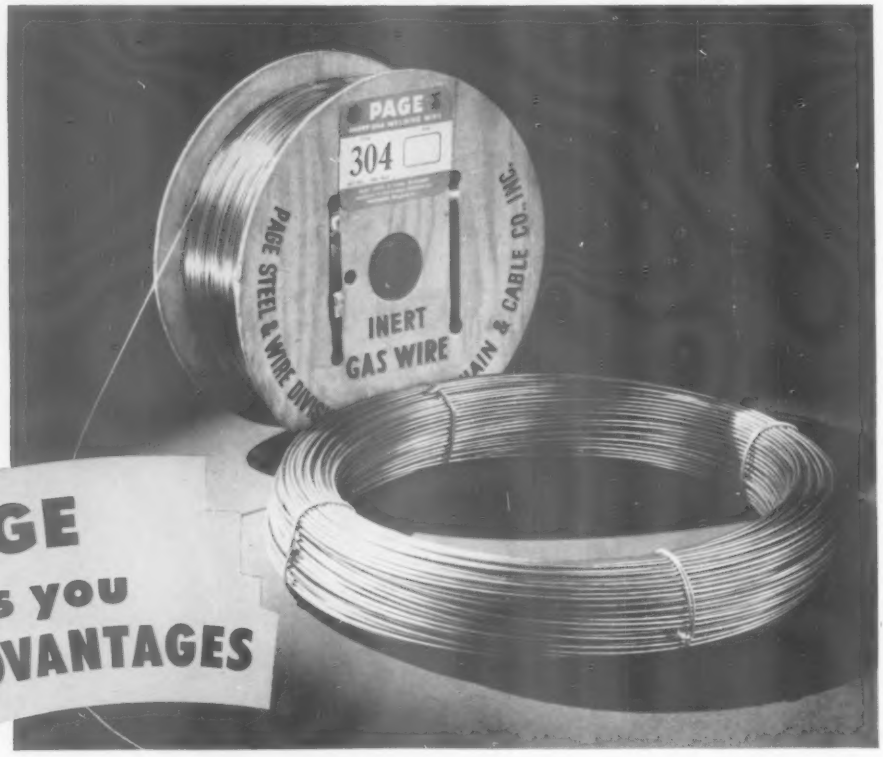
The REID-AVERY COMPANY Inc.

BALTIMORE 22, MARYLAND

SINCE 1919 PRODUCERS OF ARC-WELDING ELECTRODES AND WELDING RODS

ACCO products

Get exactly what you want when you buy PAGE



PAGE gives you 3 BIG ADVANTAGES

Advantage No. 1 — You get the exact analysis you need from the PAGE range of 26 Analyses

• There's no need to compromise on welding wire for that "special" job—for, no matter how different your requirements may be, you can get *exactly* the right wire from PAGE. *There are 26 different analyses in the* PAGE *line.* These cover the field of applications: heavy automatic submerged arc...light manual submerged arc... inert gas manual...automatic, tungsten or metal arc.

CARBON STEEL • **Any carbon from Armco (.025 max.) to high carbon (.90—1.10)**

LOW ALLOYS • **All the most popular welding grades**

STAINLESS • **All standard AISI grades. Other types on request**

PAGE offers a wide range of Gas Welding Rods • Electrodes • Spray Wire

• Your welding job deserves the right electrodes and the right rods—and you can get them from the range offered by PAGE!

Gas Welding Rods • Armco, mild steel, low alloy, 3½% nickel, carbon or stainless steel, manganese or naval bronze.

Bare Electrodes • Any carbon from Armco to high (.90—1.10) carbon.

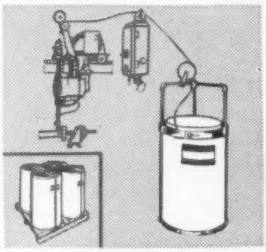
Metal Spray Wire • Any carbon from Armco to 1.00 carbon; also 3½% nickel, manganese or naval bronze, and stainless steel.

—you don't have to compromise Automatic Welding Wire!

Advantage No. 2

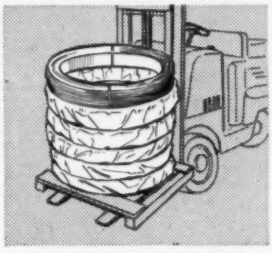
You get Automatic Welding Wire packaged to fit your requirements

• The PAGE Automatic Welding Wire packaging program was developed out of long experience and careful study of users' needs. These fine wires are packaged in a variety of ways for the most complete protection and the utmost convenience in handling and in stocking.



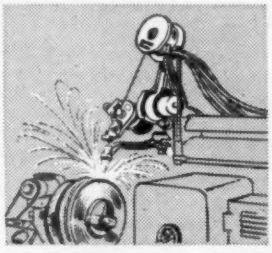
LEVERPAKS and PAY-OFF-PAKS

Lightweight and durable, Leverpaks and Pay-off-paks protect against coil distortion or wire corrosion. Compact, easily opened and resealed, roll and stack easily, take little floor space.



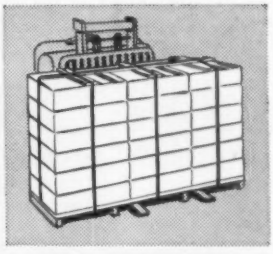
WRAPPED COILS

PAGE also offers single and pallet-mounted (1,000 lb., 2,000 lb. and 3,000 lb.) coils, each coil being wrapped in waterproofed paper and secured by steel strapping.



HANDY REELS

PAGE Inert Gas Welding Wire is available on reels: Precision thread-wound on twenty-five-pound, non-returnable reels to fit all popular inert gas welding machines.



COILS IN CARTONS

One of the most popular of PAGE packages: Coils in individual cardboard cartons, available either singly or palletized for easy handling by fork-lift truck.

Advantage No. 3

You buy from local stocks— and so you need only a minimum inventory

• You can get PAGE automatic welding wire, electrodes or welding rods quickly and easily from your nearby PAGE Distributor—no matter what part of the country you live in.

PAGE Distributors carry ample stocks from which your requirements can be filled without delay or inconvenience to you. This handy service not only saves you time in getting what you need, but makes it unnecessary for you to make a sizeable investment in inventory. Thus, your nearby PAGE Distributor is able to make double savings for you—a saving in time and a saving in actual dollars.

Get the full Analysis List

All the 26 analyses of PAGE Automatic Welding Wire are set forth in complete detail in new Folder **DH-402.** A free copy of this informative folder will be sent on request. Write our Monessen, Pa., office.

ACCO

Page Steel and Wire Division

AMERICAN CHAIN & CABLE

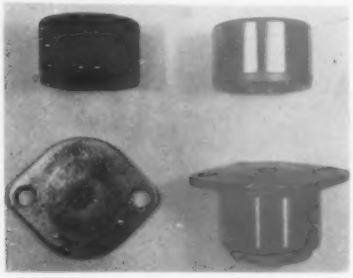
Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

Better Value

No-carbon paint aids production welding

By **M. R. Gavin,** *Manager*
Pottstown Div., Dana Corp.
Pottstown, Pa.

BEARING race and cap in various manufacturing stages. Finished item is at lower right.



BEARING races are only one of a number of mass-produced items at the Pottstown Div. of Dana Corp. When these automotive parts were initially scheduled for production, however, they presented a problem as difficult as any posed by a larger fabrication.

Low-carbon caps, a component part of the assembly, had to be welded to the high-carbon bearing races. This puzzler prompted only one immediate suggestion: copper-plate the backs of bearing races to hold carbon out of the material.

In dealing with a mass-produced item—and in view of the stripping operation entailed in the plating plan—this solution was not economically feasible.

RIGHT: No-carbon paint is daubed on back of bearing races prior to carburizing and heat treating, keeping metal underneath at low-carbon stage.

No-Carbon Paint

Production stood still while engineering personnel wracked their brains for a solution to this impossible situation. Naturally, as in so many similar predicaments, the answer was provided by sheer chance.

A commercially available no-carbon paint solved the problem. A spot of this inexpensive paint is daubed on the back of a bearing race before the heat-treating cycle.

Certain properties of the paint allow the spot it covers on the race to resist carburizing and heat. This spot, then, is as soft after heat treatment as it was before entering the furnace.

The situation now becomes one of welding low carbon to low carbon—practically no problem at all. At the same time, the high-carbon properties so vital at other points in the race structure are unaffected.

Resistance Welding

Precision welding—in which parts must be held to tolerances of 2/1,000 in.—is performed on an eight-station resistance welding unit. Special fixtures for this unit were designed and produced by the Pottstown Div.

Four distinct operations are involved. First, the assembly is manually pressed together. The plate forming the cap is then loaded on top. Third and fourth steps are welding and ejection, and, together with the second operation, they are performed automatically.

Success in maintaining the low-carbon content in the spot on the bearing race has permitted operators to speed up cycle time and develop a greater production rate with the welding unit.

EIGHT-stage resistance welder joins low-carbon caps to low-carbon spot on bearing races in four-step operation.

Now! A great new X-ray Film...

specifically designed for Today's Radiographic Advances

Kodak Industrial X-ray Film, Type AA

Out of the Kodak Research Laboratories comes a new and improved x-ray film designed to work hand-in-hand with today's other advances in industrial radiography. It is a film that retains the fine sensitivity characteristics which have made Kodak Type A the most widely used x-ray film in industry.

But more, while retaining these characteristics, the new film gives you greatly increased film speeds—speeds ranging up to more than twice the speed of Type A. So we have named this new film Type AA.

All through your radiographic operations this film will provide finer work, faster. Its characteristics and possibilities are particularly outstanding when working with today's higher k.v. x-ray machines and gamma ray sources.

Your x-ray dealer and the Kodak Technical Representative are ready to tell you about this great new film. Get in touch with them to see how much it is going to mean to you.

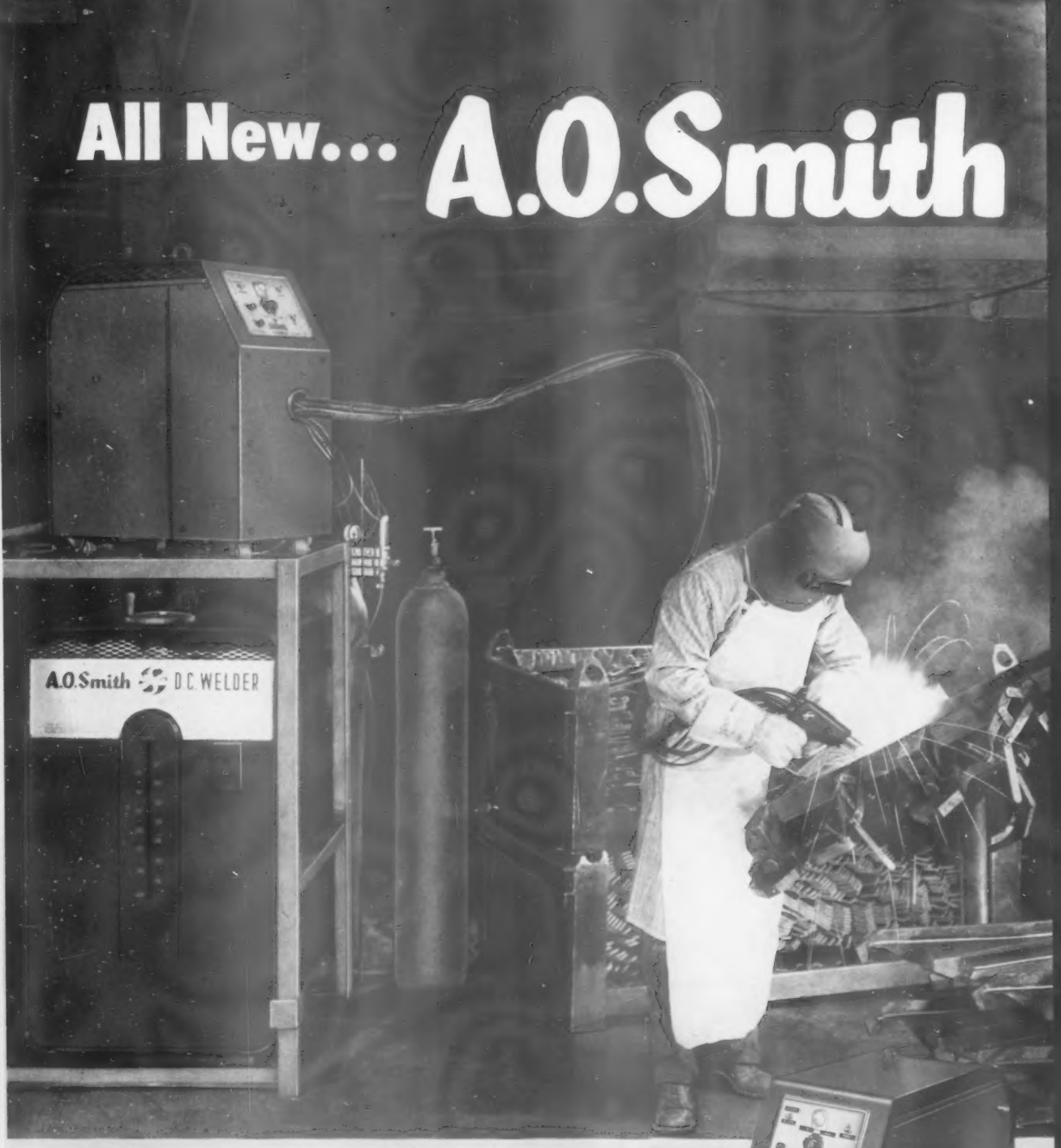
Read what the new Kodak Industrial X-ray Film, Type AA, will do for you

- Reduces exposure time—speeds up routine examinations.
- Speeds up processing cycle with existing exposure technics.
- Provides increased radiographic sensitivity through higher densities with established exposure and processing technics.
- Gives greater subject contrast, more detail and easier readability when established exposure times are used with reduced kilovoltage.
- Reduces the possibility of pressure desensitization under shop conditions of use.

EASTMAN KODAK COMPANY,
X-ray Division,
Rochester 4, N. Y.

Kodak
TRADE MARK

All New... A.O.Smith



NEW FEATHERWEIGHT HAND GUN

. . . is as easy to use as pointing your finger. Water-cooled, it has no "O" rings . . . eliminates leakage. Ends necessity for complicated switchovers when changing wire sizes. All connections are fully protected Streamline design increases visibility.

C-OMANUAL

Carbon Dioxide Hand Gun Welding

...offers amazing economy and high degree of automation!

★ Cuts gas cost to practically nothing!

1¢ per cubic foot for carbon dioxide as compared to almost 7¢ for Helium and 9¢ for Argon... and you use much less. Savings in gas alone will more than pay for your C-OMANUAL unit in several months.

★ Clean slag-free welds!

No flux to clean, no chipping, no scraping.

★ Fast, fast, fast!

Several times faster than the fastest stick electrodes... as fast, or faster than any semi-automatic process in existence.

★ Visible arc

Keeps you in the groove... assures consistent weld quality. Speeds spotting of nozzle.

★ New simplicity of operation

There's no constant fiddling with settings. Console automatically controls arc length... compensates for operator's arc distance variations.

★ Deeper penetration

Assures sound, uniform welds with excellent strength and ductility.

COMPACT, EASILY PORTABLE CONTROL CONSOLE

Mounted on free-rolling rubber casters, the control console is easy to move from spot to spot. It contains wire reel, feed and speed controls, easily traced electrical circuits and all gas and water connections — *plus the exclusive two-speed head* which allows operator to get proper feeds for light or heavy wire by mere flick of selector switch. Controls on front panel are conveniently grouped, easy to read.

Through research ...*a better way*

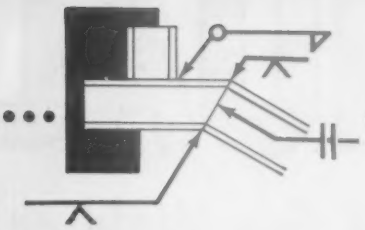
A.O.Smith

CORPORATION

WELDING PRODUCTS DIVISION

Milwaukee 1, Wisconsin

INTERNATIONAL DIVISION: Milwaukee 1, Wis.



the welding clinic

Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.

Returns on equipment investments

Question:

We have been debating for some time the advisability of adding three new equipment items to our shop. It is a relatively small shop, employing four weldors, and this equipment will probably total about $2,000. Can you give us some idea of what we might expect in the way of a return on this investment?

Answer:

The interest or return on your investment can be determined only when you have accurately listed—in dollars and cents—all the advantages you *know* can be gained by adding this new equipment.

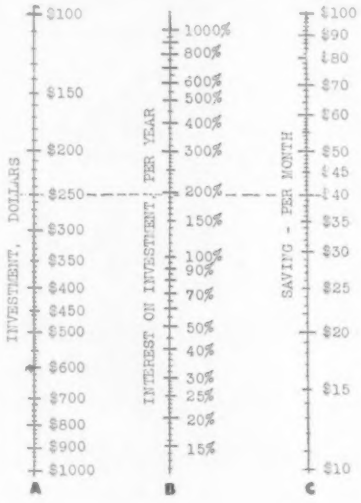
When this figure has been closely estimated, consult the chart on this page. It was prepared by William F. Schaphorst, a regular contributor to WELDING ENGINEER, and it should provide you with a percentage-of-interest figure that is highly accurate.

Finding Percentage

By connecting the two known factors—equipment cost and savings per month in columns A and C—a per annum interest rate is easily arrived at (a sample line has been drawn on the chart). In the case of a $2,000 investment, simply add an additional cipher to the $200 figure in column A, and another cipher where it is needed in column C.

It is not uncommon for certain items of welding equipment to pay for themselves in a surprisingly short time. Some investments are fully returned in a year or less.

Mechanization with modern equipment enables any welding shop operator to do better and quicker work at lower prices. If it is properly operated



and fully utilized, any new equipment item should do its part to reduce costs and increase profits.

* * *

Question:

Do you have a chart or booklet that lists recommended amperages for various electrode sizes? Some of our weldors have a lot of understandable difficulty remembering correct settings, and we would like to provide them with some sort of handy guide.

Answer:

We do not have an all-inclusive chart such as you describe. However, the amperage recommendations for different electrode sizes are always listed by manufacturers on electrode cartons. The range of settings on these boxes are correct for the particular type of electrode being used.

By gathering a full set of cartons, you could make a simple chart containing all amperage settings for the electrode sizes most commonly used in your shop. Or, you might follow an easier course.

Decimal Charts

The decimal equivalent charts found in every shop contain a good answer to the correct amperage problem. Decimal equivalents for each electrode diameter comprise an excellent estimate of the approximate amperage to be used.

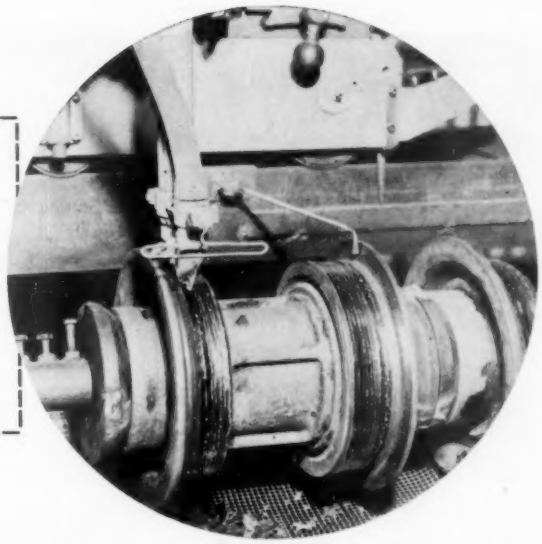
For instance, a $\frac{1}{8}$-in. electrode has a decimal equivalent of 0.125. A manufacturer would normally recommend an amperage range of 90 to 125 amp for a $\frac{1}{8}$-in. electrode, so the decimal equivalent obviously fits into this range.

The same holds true for 5/32-in. (0.156), 3/16-in. (0.187), and $\frac{1}{4}$-in. (0.250) electrodes. In each case, the decimal equivalent constitutes a proper amperage setting.

The Editors will make every effort to answer all questions submitted to this department. If you have a question concerning welding or related processes—or a tip you would like to pass along to other readers—send it to *The Welding Clinic*.

Does it pay to

REBUILD TRACTOR ROLLERS?



here's one answer...

This is a report from one of the country's largest tractor maintenance shops having complete facilities for crawler reconditioning. It particularly concerns rebuilt track rollers, a major item of wear. In this shop rollers are regularly rebuilt and hard-faced by the automatic electric welding process, using Stoody 105 on the running surface and flange.

About a year ago a tractor came into the shop for overhaul. The rollers were badly worn; those found suitable for rebuilding were returned to size with Stoody 105 and the internal assemblies thoroughly reconditioned. The balance of the rollers were discarded and replaced with standard parts. Following routine procedure, the shop foreman checked the entire crawler assembly to insure proper alignment—*a highly important factor in reducing needless wear.* After 2500 hours this tractor came in again for its customary overhaul. Inspection of the rollers disclosed the following:

The standard rollers, without exception, were worn from ⅜" to ½" on the running faces; in all cases the internal assemblies required several replacement parts.

Hard-faced rollers showed negligible wear on running surfaces and the only replacements needed were new seals for internal assembly.

It is of course an accepted fact that rollers rebuilt and hard-faced with Stoody 105 by the automatic method give a service life considerably beyond that of standard replacements—at a much lower cost. The hard-faced roller with its superior abrasion resistance reduces uneven wear on the track rails by providing a smooth, even working surface that allows free movement of the rails and resists grooving of the roller. Hence, wear on the internal roller assembly is also decreased.

Stoody 105, the alloy used in this application, was the first automatic wire of its type and is today the alloy generally preferred by principal shops. It has been proven by eight years of actual field use—assurance of maximum service life at reasonable cost.

Earth-moving contractors operating large fleets of tractors, shovels, buckets and crushing plants often find the installation of an automatic welding head a profitable investment for rebuilding rollers, idlers, house rolls, crusher rolls and similar wearing parts. Many contractors, however, prefer to send such work to a thoroughly equipped automatic job welding shop of which there are a number located throughout the country. *A list of these job shops is available on request.*

Complete information on automatic hard-facing installations and procedures will gladly be supplied—without obligation. You may consult your local Stoody dealer—see the "yellow pages" of your phone book under "Welding Equipment and Supplies"—or write direct.

STOODY COMPANY
11941 East Slauson Avenue, Whittier, California

WELD PREPARATION with the

saves
TIME and MONEY

• **SAVINGS** in fabrication costs up to 50% have been reported by users of the Arcair Torch for weld preparation. The usual Arcair procedure is to butt unbeveled plates together and either tack weld or run a sealing bead along one side of the seam. The joint is then gouged from the opposite side, usually with one pass of the Arcair torch, leaving a clean even groove ready for welding. On heavy plates the backside is then gouged to sound metal and welded.

Welding without prebeveling

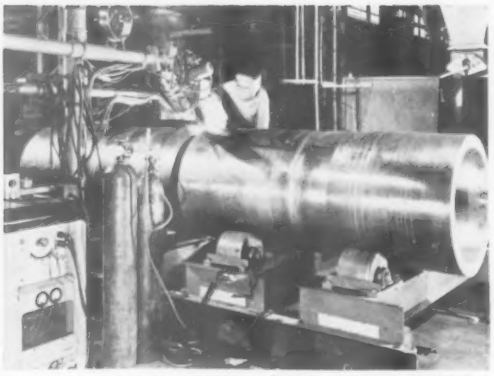
EASE OF FITTING—as well as elimination of burning slab operations with necessary extra handling—plus the fact that both plates are prepared by a single pass of the Arcair Torch which is economical to operate, make this method faster and cheaper than those previously used.

THE NEW L MODEL Automatic Travel Torch, which takes the torch out of the operator's hand and places it on a tractor or in a fixture, is particularly adaptable to this operation. Write for complete information.

Arcair Company
427 S. Mt. Pleasant Street
Lancaster, Ohio

Write
for your FREE copy of Arcair's new "CASE HISTORY BOOK". See positive proof of Arcair money-saving performance in countless industries!

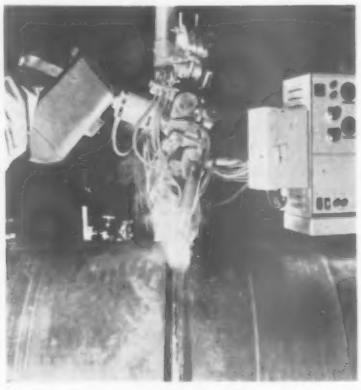
SOLD BY WELDING SUPPLY DEALERS



POWER rolls turn sections at a speed of 15 ipm for welding application.

—Courtesy Ampco Metal, Inc.

Automatic Mig joins 5-in. cast rolls



SECOND pass is made by automatic Mig unit, depositing weld beads in deep U-groove between cast sections of breast roll. No preheat was needed.

A FOURDRINIER machine produces paper from pulp in a literally endless web. The component parts of this huge machine, subjected to a continuous flow of highly corrosive chemicals, are also in almost constant operation. In the process, then, they take quite a beating.

Construction of these parts obviously has to be a selective, carefully-controlled operation, done with an eye to both safe and long-lasting operation.

In need of a large breast roll for one of these machines, a paper manufacturer recently ordered centrifugally-cast, copper-aluminum-iron sections. This alloy, in addition to its high resistance to corrosion from wet-strength stock, also possessed characteristics which suited it to the firm's choice of a fabrication method: the automatic Mig (metal inert-gas) process.

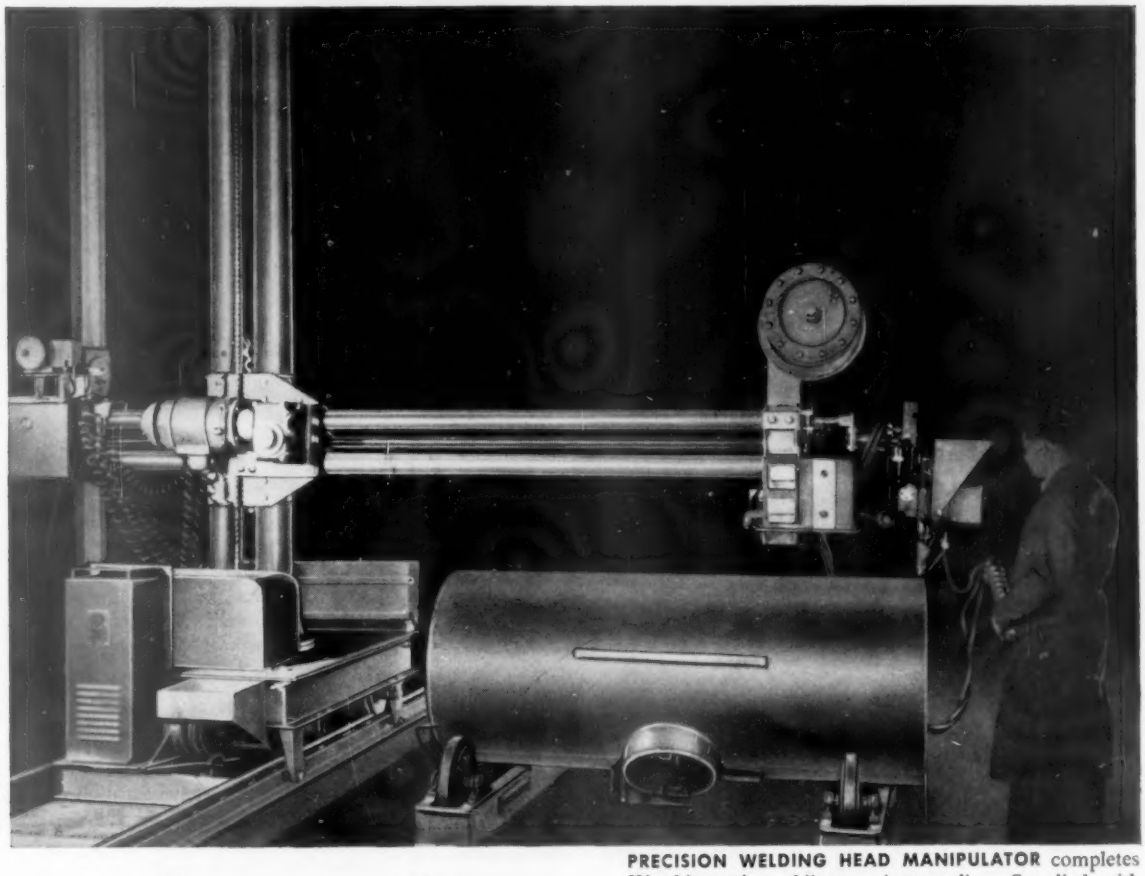
Welding Procedure

Each approximately 5 in. thick, the cast sections were bevelled with a modified U-groove. Mounted on turning rolls, they were joined with ⅛-in. welding wire. Reverse polarity direct current was supplied by a constant-voltage rectifier welder at 480/510 amp and 29 volts.

Shielding gases for this Mig application were argon (70 cfh) and helium (25 cfh). Wire feed was 88 in. per minute, and travel speed was 15 ipm.

No preheat was used because of the uniform flow of weld metal into side walls and adjoining beads. There was no oscillation or peening of the weld beads.

Weld deposits were wire brushed between passes, and the completed breast roll was stress relieved before final machining.



PRECISION WELDING HEAD MANIPULATOR completes Worthington's welding equipment line. Supplied with welding head and accessories of customer's choice.

Announcing...
new automatic welding head manipulator

Only Worthingon now offers complete equipment line plus nationwide sales and service

Now you can get all the basic equipment you need for your automatic welding operations from Worthington.

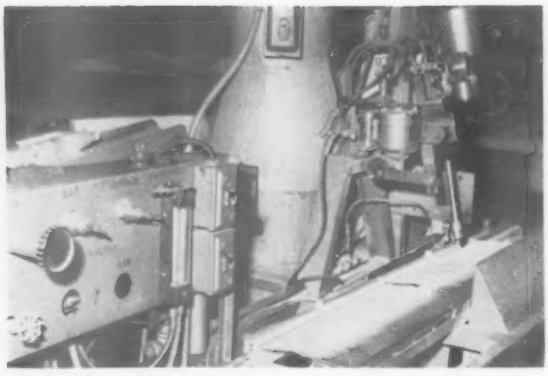
With the addition of this new, custom-manufactured precision-designed welding head manipulator to its line of welding positioners and turning rolls, Worthington now offers a complete packaged deal to automatic welding equipment users.

What's more, Worthington is the *only* manufacturer offering all the equipment you need—*plus a nationwide sales and service organization.* You get the equipment you need *when* you need it—and we're there to see that it works *after* you get it. Bring your positioning problems to Worthington for a quick solution.

Find out how the new Worthington packaged positioning equipment deal can help you. Write today for free literature to Worthington Corporation, Positioning Equipment Division, Section Y.6.1, Harrison, New Jersey. Y.6.1

WORTHINGTON

BRAZING alloy is sprayed on lower edges of partially-masked cones by metallizing unit. Cones are on conveyor.



CONDUITS on a rack receive application of brazing alloy as spraying unit oscillates.

Automated brazing forms rifle grenades

By Howard E. Jackson

SEMI-AUTOMATED brazing practices to fabricate a new Army rifle grenade are being applied by SMP Co. (formerly Screw Machine Products) of Portland, Ore. The M-31 grenade is launched from a standard infantry rifle.

The 17-in.-long rifle grenade consists of a nose, body assembly and fin or stabilizer assembly. The latter portion is mounted on the rifle.

The small nose piece is made of the same gage (0.0175 in.) of cold-rolled steel as are other parts. Nose pieces are silver plated, and are not brazed to the unit.

Aiding Flight

Body assemblies consist of a body section at the rear which holds the charge, and an ogive, or front section, which gives the grenade aerodynamic flight characteristics. A cone inside the assembly separates body and ogive into two airtight compartments. The cone wall has an 0.002-in. thickness tolerance.

A copper tubing conduit (purchased round, but formed to a rectangular shape in a punch press) extends from front to rear of the body assembly. After forming, these conduits are "bright dipped" (*i.e.*, given a chromatic acid dip, followed by a rinse).

The stabilizer assembly consists of an aluminum impact extrusion stabilizer tube and a four-pointed fin. The tube is the only ready-made part of the rifle grenade purchased from an outside supplier. No brazing is done on the fin assembly.

Automated Work

Most phases of grenade fabrication — punch press work, brazing and finishing — are semi-automated procedures. Materials handling has practically been eliminated by a space-saving network of conveyor belts and chain lines.

After initial forming, bodies, ogives and cones are given a taper-form. Bodies and ogives are then copper-plated.

Cones are given sharp points when they receive final form in a 400-ton punch press. Wall thickness of the cones is inspected on a 100% basis, and the results of this inspection often indicate areas where critical brazing must be done.

Allowable variation in wall thickness on the cones is 0.034 to 0.042 in. at the tip; 0.035 to 0.040 in. at the center, and 0.035 to 0.039 in. at the base

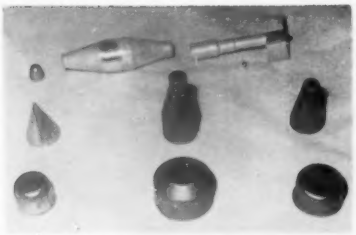
After being trimmed to length in a turret lathe and deburred in a drill press, cones are slot-broached in a 10-ton press to receive the conduit. They are then put through a trichloroethylene vapor degreaser, dipped in chromatic acid and given two water rinses.

Metallizing Unit

An oval metallizing unit sprays brazing alloy on the base edges of cones after edges have been dipped in flux. Caps placed over the cones protect those parts which do not receive alloy applications.

Propane is employed as a fuel gas in the alloy spraying unit. Brazing alloy sprayed on the cones as they pass on the assembly line is melted by a series of natural gas burners

OGIVE is pressed onto grenade body and brazed at this indexing table. Pneumatic cylinder forces parts together.



PARTS in first row are blanks and cupped shapes of finished parts in second row. Last row shows nose, body and fin assembly.

and flows into place. Cones are then removed from the conveyor, ready for assembly.

Purchased round, copper tube conduit is cut to length and deburred. Following a chromatic acid dip and water rinse, the tubes are squared and formed to rectangular shape.

In a manner similar to that employed with the cones, conduits are laid on a rack and areas not to be brazed are masked. An oscillating spray unit then applies alloy to the conduits.

Final Assembly

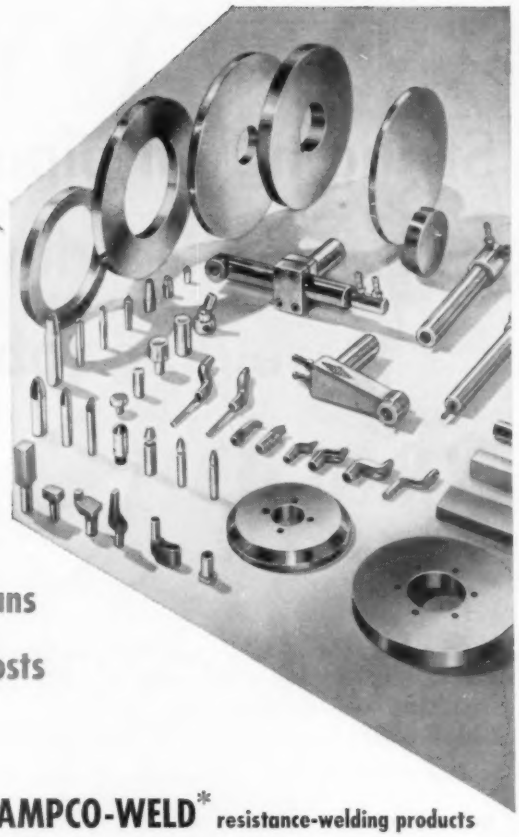
Final brazing assembly begins at a 12-station indexing table where conduits are joined to bodies. Bodies are placed over conduits on this table, and a single gas flame that moves briefly with the unit as it is indexed around the table reheats alloy on both body and conduit to effect a sound joint.

Next step in final assembly is the fluxing of the inner body. Cones are then pneumatically pushed to the proper depth within the body, and a preformed clip is inserted between body and conduit. Four flames on another 12-station indexing fixture remelt alloy to join cones to bodies.

As parts progress toward the last step in final assembly, a pneumatic cylinder forces ogives against bodies and the joint is fluxed with a sponge. Alloy is then fed automatically onto the joint, where a gas torch heats it for final joining.

All brazed joints are cleaned by wire brushing. Visual inspection is then made, followed by checks for concentricity and an air pressure test to determine whether all joints are sealed.

Completed body and tail assemblies are bonded, painted and packaged at SMP Co., before they are turned over to Army Ordnance.



You've Got What It Takes

for longer runs and lower costs

...when you use AMPCO-WELD* resistance-welding products

Every item in the complete Ampco-Weld line is manufactured under strict laboratory control to give you longer runs and lower costs.

AMPCO-WELD spot-welding tips — stay cooler — won't stick to the work . . . tough — resist mushrooming and wear . . . fewer dressings needed — they last longer, cost less.

AMPCO-WELD rod — is available from stock — either in rounds, including hex, or in square and rectangular bars. There's a size for every need — all feature Ampco toughness and high electrical conductivity.

AMPCO-WELD seam-welding wheels — many users report 150% longer life. Resist wear — even at elevated temperatures. High electrical conductivity. Get them on short notice as rough forgings, finished blanks, or fully machined.

AMPCO-WELD resistance-welding holders — to suit every job — straight, offset, and universal ejector models. Offset and universal holders have interchangeable sockets for No. 1 and No. 2 Morse tapers. You change tapers without changing holders.

All Ampco-Weld resistance-welding products meet or exceed RWMA specifications. Experienced engineering service is also available. Get what it takes to lower your resistance-welding costs — get Ampco-Weld, the best value for your resistance-welding dollar.

RW-1S

AMPCO

Sole producer of genuine Ampco Metal

AMPCO METAL, INC.

Dept. WE-6

Main Office and Plant • Milwaukee 46, Wis.

West Coast Plant • Burbank, California

*Reg. U. S. Pat. Off.

Part II:

Stringing oil pipe is a mile-a-day welding job

—Courtesy Lincoln Electric Co.

By A. G. Barkow, *Supt. of Inspection*
Natural Gas Pipeline Co. of America
Chicago, Illinois

QUALIFICATION of weldors by methods previously described usually averages 50% acceptable for any group of experienced pipe line weldors. Only pipe line weldors with considerable experience can produce welds which will pass visual inspection and be acceptable for physical testing.

These men, to a large degree, are trained during construction of pipe lines. Each weldor is assigned a helper and most helpers are embryo weldors. They are in training under the tutelage of their assigned qualified weldor to become pipe line weldors in their own right.

After helpers have followed pipelining for some time and feel they can pass qualification requirements they request, and are usually granted, permission to make such a test.

A number of tests frequently end in failure and much additional training is required before the helper finally passes a test and is granted permission to weld with a regular crew.

Production Welding

Actual procedure of pipe line welding in the field can best be seen by reviewing the work on a pipe line "spread" laying 36 in. O.D. high-pressure line pipe with a 0.438-in. wall thickness. Such a spread has extended a 36-in. line from Hersher, Ill., to the south bank of the Illinois River, where it joins a 30-in. line to serve the Chicago metropolitan area.

Weldors required for this spread are divided into three groups, the first including four stringer bead weldors and four hot pass weldors.

The stringer bead weldors work simultaneously on the four quarters of the pipe. The hot pass weldors, two to each weld, work in pairs, leap frogging each other to stay within one completed weld made by the stringer bead weldors.

Each weldor in this group has a helper who provides him with electrodes, changes machine settings and cleans welds between passes.

The second group will include twenty finish weldors. Each man completes a group of three welds, then moves to the next series assigned to him. The final group of five weldors will do tie-in work and welding necessary to set valves and other pipe line appurtenances.

Welding machines used in the field are usually 300-amp gasoline or diesel-driven, and are mounted on tractors or movable trailers.

Line-Up Clamp

In assembling joints, an internal line-up clamp is used to hold joints in place. The line-up clamp is activated by mechanical, hydraulic or pneumatic power. The clamp is designed to hold two ends firmly in place so the stringer bead can be made without a need for tack welding.

Prior to assembling the pipe, each end bevel is cleaned by power-driven buffers or grinders. Damaged ends are either refinished or cut off, depending on the amount of damage done.

Cleaning between stringer bead and hot pass is accomplished by use of power buffers or grinders and is supplemented by use of ice picks, chisels, files or other tools to clean out slag entrapment in holes or grooves between deposited bead and side walls.

Cleaning at this point is an extremely important operation and improper cleaning can mean the difference between a sound weld and a weld which is later rejected by radiographic or visual inspection.

Movement of pipe during and after the stringer bead

AUTOMATIC TORCHES

THE HEART OF ECONOMY

Approved by Underwriters' Laboratories

BY ACTUAL COMPARISON

USING NON-AUTOMATIC TORCH . . . . . 12 Pieces Welded
USING NON-AUTOMATIC WITH GAS SAVER . . 18 Pieces Welded
USING HARRIS AUTOMATIC TORCH . . . . 28 Pieces Welded

Using the same amount of Oxygen and Acetylene for each set-up, this "Actual Comparison" Demonstration proved the Harris Automatic Torch to be a profitable investment for economical and efficient welding work.

Let our local Distributor show you the "Actual Comparison" test in your plant and explain quickly and simply why the Harris Automatic has the greater piece production at the lowest cost.

ALMOST 50 YEARS OF "KNOW-HOW"

Harris is the originator of the "Automatic" Torch and with almost 50 years of building "Know-How" behind every torch, the buyers and users get tremendous returns on their torch investment.

Harris' long established Distributors, located in all principal cities in the United States and Foreign Countries, are at your service.

HOME OF AMERICA'S FIRST AND FINEST GAS WELDING AND CUTTING APPARATUS.

THE HARRIS CALORIFIC COMPANY
Cleveland 2, Ohio

HARRIS

SERVING THE METAL INDUSTRY SINCE 1905

DOPE gang wraps pipe by machine before lowering section into trench.

Courtesy Caterpillar Tractor Co.

is made, holding and operation of the line-up clamp, and resting of the pipe on wood skids after the stringer bead is completed, as well as all other factors that cause vibration in the line at this time, are also problems that can seriously affect quality and soundness of completed welds.

Working Gap

To prevent interference between welding groups, a gap ranging from one-half to one mile usually is maintained between hot-pass and finish-bead weldors. This gap is necessary to prevent delaying finish-bead weldors should difficulty be encountered in the line-up operation.

Gaps greater than one mile should be avoided because of possible strains set up in the welds if they are not completed within a reasonable amount of time.

While this pipe is of weldable quality, it has become a common practice to use some preheating when atmospheric temperature approaches freezing. Preheat is done with a kerosene torch and temperature is held at 200 F or less.

Crew welding will produce an average of 100 welds per 10-hour day. The four stringer bead weldors will complete a stringer bead and move the length of a pipe joint to be ready for the next stringer bead in approximately five minutes.

The hot pass crew, working directly with the stringer bead crew, will be moving at approximately the same rate of speed. In finishing a weld of this size, the finish weldor will require approximately two hours, completing the weld with four additional passes and possibly a stripper or half-pass on each side.

This averages out to approximately three weldor man-hours per finished weld on this pipe size. The rate of advance in field welding varies considerably with terrain being covered and with changes in atmospheric temperature.

Inspection is Vital

With the high-speed production rate of pipe line welding, inspection becomes a prime factor. Visual inspection is performed by a welding inspector and several assistants who are stationed with each welding crew.

The chief welding inspector usually follows the stringer bead and hot pass weldors, since this is by far the most important operation. After completion, each weld is visually examined for undercutting, pits and incomplete coverage.

Following this inspection, a radiographic crew using an internal "pig" will examine 30 to 40% of all welds made. Welds under road crossings, railroads, rivers and through swamps are usually 100% inspected by such radiographic methods.

The radiographic weld inspectors examine all films immediately after development. From this examination, the welding inspector can judge weld quality and make corrections in technique or warn individual weldors where there is apparent deviation from desired quality.

Welds which do not meet specified requirements are rejected and may be repaired or removed from the line, as directed by the inspector. Limits of acceptability of defects as shown by radiographic examination are detailed in API Std. 1104.

Final Line Test

After a 10 to 20-mile section of pipe line is completely welded, it is subjected to a hydrostatic or a gas pressure test in excess of actual operating pressure. These test methods are prescribed in ASA B:31.1.8 of the Code for Pressure Piping.

The history of pipe line welding shows that quality was always foremost in the minds of designers and that welding techniques and methods constantly were improved. Although this country is now criss-crossed by some 700,000 miles of high-pressure pipe lines carrying both gas and petroleum products, pipe line welding is still very young.

With additional thousands of miles of pipe line being planned each year, welding engineers are busily engaged in research to improve welding and to increase production speeds.

Automatic welding, using submerged-arc methods, has been given serious consideration for many years and, although no successful method of girth welding has yet been found, research laboratories have not lost interest in this method.

Research is also being conducted in the use of inert gases and in other newly developed welding methods. It is with confidence, therefore, that the welding engineer in pipelining is looking forward to newer and brighter horizons.

this is the *whole* x-ray machine?

sure is... a complete radiographic inspection unit in a rayproof housing no larger than an ordinary filing cabinet. Just about as easy to install too; needs no heavy power lines, no operator's booth or other radiation-protective construction. Operating at from 5 to 50 KVP, it is ideal for inspection of light metal weldments and castings, precision assemblies, plastics, wood, glass, metal or what have you. An extension cable lets you x-ray parts too large to fit into the cabinet (jobs like inspecting air frames).

If you need to spot hidden defects to keep a firm finger on quality control, we'll be glad to tell you what this unique unit (or others in the broad Picker x-ray and gamma line) can do for you.*

some other Picker units...

150 KV
up to 1" steel, 5½" aluminum

250 KV
lightweight, portable

250 KV
for heavy duty inspection

GAMMA
sources, equipment, containers

INSPECTION CABINETS
eliminate lead-lined rooms

ACCESSORIES
films, cassettes, tanks, chemicals, darkroom sundries . . . everything

**There's probably a Picker District office near you (see local 'phone book). Or write Picker X-Ray Corporation, 25 South Broadway, White Plains, New York.*

one source for everything in radiography and fluoroscopy

Picker x-ray

P&H DC Rectifier Welders

Cut Power Costs Nearly 30%

You take a big slice out of welding costs with the P&H DC Rectifier Welder. It can reduce your power bill for welding operations by nearly 30% because it uses less current under load, and practically no power during idle and no-load periods.

This P&H DC Welder gives you lower maintenance costs, too. There are no moving parts to wear out — no brushes, bearings, commutators, or brush riggings to replace — no costly downtime.

You produce better welds — put down more metal with the P&H DC Rectifier Welder because it has the exclusive P&H Dial-lectric Control that gives you instant, exact heat. Just a twist of the wrist results in quick response within the entire working range.

You get extra-value features too—protection against unbalanced conditions in the primary input line, thermal overload protection, primary line switch, range switch, remote control, and many other time-saving developments.

Four sizes are available — 200-, 300-, 400-, and 500-amp capacities. (NEMA rated). Write today for more information.

HARNISCHFEGER
MILWAUKEE 46, WISCONSIN

I'M SMOOTHARC SCOTTY... and I'm loaded with information that shows how P&H DC Welders cut costs. Just drop me a line or send the coupon.

P&H DC Rectifier Welder with quick-acting Dial-lectric Control—NEMA-rated. Available in 200-, 300-, 400,- and 500-amp capacities.

SEND COUPON TODAY FOR **FREE** INFORMATION

P&H **HARNISCHFEGER CORPORATION**
Welding Division
4513 West National Avenue, Milwaukee 46, Wis.

Attention: W. R. Stephens, Sales Manager
Please send me information on P&H DC Welders.

Name ..... Title .....

Company .....

Company Address .....

City ..... Zone ..... State .....

3089

the P&H *Line*

P&H welding equipment is manufactured and sold in Canada by REGENT EQUIPMENT MANUFACTURING COMPANY LTD., 455 King Street West • Toronto, Ontario, Canada

"My men weld twice as fast with Airco Easyarc 12 rods"

The thick powdered metal coating on the Easyarc 12 electrode provides welding speeds that are about twice that of a conventional electrode, and results in excellent arc characteristics and ease of operation. Beads are very smooth and of good appearance. Slag removal is so much easier that definite savings in time are achieved. In welding mild steel, Easyarc 12 is excellent on build-up applications.

This is but one of many electrodes in Airco's complete line that also includes stainless steel, hard-facing, cast iron, general and special purpose electrodes. Send for free Airco Electrode Guide which will help you select the right electrode for your specific job. Request catalog 1318-WE.

AIRCO

AIR REDUCTION

New York 17, N. Y.

Offices and dealers in most principal cities

On the west coast—
Air Reduction Pacific Company
Internationally—
Airco Company International
In Cuba—
Cuban Air Products Corporation
In Canada—
Air Reduction Canada Limited

LETTERS .... *from page 10*

but because of the absence of adequately trained personnel they are the only men who can present anything approaching the necessary qualifications. That experience is all practical because of the difficulty in finding suitable literature, and the reluctance of many to search out, and use, what is available.

I am convinced that any school offering a two year program leading to an associate of engineering degree, would attract the attention of many men with years of practical experience.

I am at present searching for an engineering school that offers an elastic curriculum applicable to the type of work expected of a welding engineer in the field. I am 39 years of age but I am making definite plans to return to school. I am quite convinced of the unlimited opportunities for adequately trained welding engineers.

Any work that WELDING ENGINEER can do to alleviate present conditions will certainly be appreciated by many people. But we need those engineers NOW!

Allen Short
Toppenish, Wash.

Welding a home

Dear Sir:

The article by Harry J. Miller, "Do it yourself—weld a house!," in the May issue was very stimulating. Since Newton, Kansas, near Wichita, is a fast developing city in homes as well as industry, I am greatly interested in discovering where I can purchase lightweight structural beams.

Merle S. Davidson
Davidson's Welding Shop

—For more information about lightweight beams the writer has been referred to Penn Metal Co., New York City, and the American Iron & Steel Institute, New York City.

"EDUCATIONAL MOVIE, -- ON ARC WELDING."

SPECIAL SPECIAL

Due to the recent death of Mr. Fred C. Archer, it is necessary to liquidate the inventory of electrode ovens to settle his estate. We offer the Archer Blueweld electrode oven at the following prices.

MODEL 400, 110 OR 220 VOLT
$100.00 Each

WITH DUAL CHEMOELECTRIC DEHYDRATORS
$125.00 Each

F.O.B.: Newark, N. J.

The manufacture of this unit will continue and replacement parts will be available.

ONE EXTRA DROP OF WATER CAN SKYROCKET WELDING COSTS

IT PAYS BIG DIVIDENDS to stabilize electrode moisture content with the Aridair STABILIZER

EXCLUSIVELY ARIDAIR
• Dual chemoelectric dehydrators
• Completely ventilated • Electrically heated
• Thermostatically controlled • Recessed shelving
• Multiple unit stacking • All steel construction

Send orders to your local welding equipment dealer, or to

ESSEX WELDING EQUIP. CO. INC.
17-19 Tichenor Lane Newark, N. J.

New Jersey's Largest Distributor of Welding Equipment

new products . . . . . USE CARD ON PAGE 91

CUTTING torch used with portable machine carriage is for light-to-medium metals.

METALLIZING gun permits thermal spraying without compressed air.

Cutting torch

MACHINE cutting torch is claimed capable of cutting metals from light gage sheet to 8 in. slabs. Designed for use with the "CM-45" portable machine carriage, torch can be used with any carriage equipped with suitable torch rigging.

Torch operates on medium-pressure acetylene or other fuel gases. It is intended for continuous or intermittent straight-line, bevel-, and circle-cutting. Rotary-motion cutting-oxygen valve is located at front of torch. Plastic valve packing gives gas-tight sealing, states manufacturer. Cartridge-type mixer can be removed for maintenance without disturbing alignment or rigging; is said to provide efficient, flash-back resistant mixing. Torch head is hexagon-shaped for easy nozzle change. Cutting nozzles available for use with oxyacetylene, oxypropane and oxymethane. *Linde Air Products Co.*

Circle No. 1.

Grinding wheel

DISC wheel is saucer-shaped, with grinding angle built in. Wheel, termed "Tuf-cut," is modification of reinforced depressed-center type. Wheel allows operator to assume more comfortable position; operator has only to tilt heel of the saucer instead of raising machine to conventional clearance angle.

Saucer can be used flat for surfacing; can also cut into sharp corners without tilting. Can be used down to arbor and on both sides. Special adaptors "TC2" are required for mounting. Wheel is available in 7 and 9 in. diameters, in ¼ in. thickness. *Precision Grinding Wheel Co., Inc.*

Circle No. 2.

Brazing preform

SILVER brazing preform is available in variety of sizes and shapes. Sintered preform can be made either to standard silver formula or to nearly any analysis of the alloy, states the manufacturer. Tolerances are closely controlled. In addition, sintered preforms of brass and copper are also available. *Mansol Ceramics Co.*

Circle No. 3.

Helmet pad

HEAD gear pad is made from top grade sheeps wool, with snap fasteners for easy fastening. Helmet pad "No. 561" is designed for the ratchet section of all makes of head gear using this adjustable feature. *John Tillman & Co.*

Circle No. 4.

Metallizing gun

COATINGS of stainless steel, bronze and other metals, hardfacing materials, and ceramics (as alumina and zirconia) can be thermal sprayed, without use of compressed air, with "Type P ThermoSpray" gun.

The "ThermoSpray" powders, developed for use with gun, are held in a reservoir atop the gun (or in a separate hopper, fed to gun through a hose.) Powders feed through connector into the gun, picked up by gas flow and fed to gun nozzle. Two lightweight hoses carry oxygen and either acetylene or hydrogen, depending on work and powder.

Self-fluxing alloys for hardfacing may be left in as-sprayed condition semi-fused or completely fused to base material. Stainless steel or bronze are used as-sprayed. *Metallizing Engineering Co., Inc.*

Circle No. 5.

Abrasive blast cleaner

AIRLESS abrasive blast cleaner is for cleaning parts with internal open cavities difficult to clean completely. It can be used in cleaning of cast automotive engine blocks or etching cleaning of welded water heater tank shells before glass lining or poreclain enameling.

The "UB" monorail-type blast cleaner places work so that cavities are exposed to the abrasive shower from a single hurling wheel during entire blasting time period. Double-chain drives increase rigidity of work-holding hooks on the conveyor. *Wheelabrator Corp.*

Circle No. 6.

Welder control

SINGLE knob control is for spot and projection welders. The "Cali-Matic," provides single knob setting of welding variables within capacity of the machine. These include welding force, time, heat control and transformer tap selection and hold time.

To the small shop handling a wide variety of work, "Cali-Matic" is said to permit instant, accurate setting; can be used in large shops for simplifying and standardizing process control. The single setting knob, with 30 calibrated positions, covers over 100 combinations of materials and thicknesses. The control is shown mounted in upper right of spot welder. *Thomson Electric Welder Co.*

Circle No. 7.

Hand shield

STURDY fiber hand shield is lightweight. The "No. 665-A," hand shield has strong, securely riveted handle. Shield can be used in variety of welding operations. *The Fibre Metal Products Co.*

Circle No. 8.

Mig welder

RECTIFIER 800-amp automatic welder is for Mig (metal inert-gas) welding. Available in three models, welder has quiet operation, combination cleaning-cooling fan, removable side covers and silicone insulation.

Basic unit has hand adjustment of arc voltage by adjustable autotransformer. Regulated constant potential model has automatic adjustment of voltage; it is claimed to have true constant potential. The "Fillerarc" model has a circuit giving rising volt-ampere characteristic, producing a slope that maintains constant arc lengths. All three models are rated at 800-amp, 15 to 40 volts continuous; 95% power factor. They weigh 620 lb, 44 in. high, 31 in. wide, 26 in. deep. *General Electric Co.*

Circle No. 9.

INTERMITTENT PASS used in hardsurfacing sprocket reduces rebuilding time and alleviates grinding by sand and mud.

TRACTOR IDLER shows herring-bone pattern of hardsurfacing created by intermittent pass. Grind and wear is reduced by this method.

Welder develops hardsurfacing shortcut using RANITE and intermittent pass

IN LOOKING for a more economical and quicker way to hardsurface tractor sprockets and idlers, Welding Foreman Art Powell of the L. E. Webb Construction Co., Inc., Santa Maria, Calif., hit on the idea of applying Ranite metallic coated hardsurfacing materials with an intermittent pass. In using this technique Powell lays down alternating beads with a gap between.

After trying other methods, Powell found this combination required less rebuilding time and at the same time effected a substantial dollar saving on each job.

Tractors of the Webb Construction Co. operate in both loose sand and mud with parts subject to continual heavy abrasion. When an intermittent pass is used on sprockets and idlers, resulting gaps formed between beads provide escape channels for the sand and mud, reducing grind and wear on these parts.

ART POWELL, welding foreman for L. E. Webb Construction Co., Inc., long-time Ranite user, combined Ranite with intermittent pass to reduce hardsurfacing time.

Although the Webb Construction Co. has been a Ranite user for more than two years, this is the first time Ranite was used for tractor maintenance and applied with an intermittent pass. Both Ranite "A" 3/16 and "B" 3/16 are being used for this purpose. Ranite was selected for its fast deposition rate, its resulting smooth weld bead and because it will not work harden.

Prior to shifting to Ranite, rollers were either sent out for rebuilding by automatic or were replaced with new ones. Actual savings now produced by using Ranite over automatic is $6 per roller with savings on sprockets and idlers totalling more than half previous costs. In addition, Webb Construction Co. has reduced actual hardsurfacing time by 50 per cent with the Ranite and intermittent pass combination.

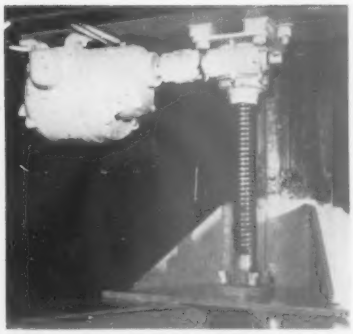
Original parts used by them have a normal life expectancy of between 2000 and 3000 hours. Indications of Ranite hardsurfaced parts checked at 1000 hours of use are that the service span will be increased as much as three times.

Ranite, manufactured by Rankin Manufacturing Co., is the original metallic coated hardsurfacing rod in use throughout industry since 1938. It is made in several grades with a rod available to fit any hardsurfacing job. Toughness in proper relation to hardness is the answer to any wear problem and Ranite is alloyed on this principle with each grade being proportioned to give maximum wear for the job it is designed to do.

Cut your hardsurfacing time and costs now by shifting to Ranite. There's a Ranite rod for your particular application. For further information see your Ranite distributor or write to

Ranite
HARDSURFACING
WELDING MATERIALS

RANKIN
MANUFACTURING CO.
DEPT. E-1
616 SO. MARENGO AVE.
ALHAMBRA 2, CALIF.



Positioners

PEDESTAL models of welding positioners have been redesigned to incorporate worm gear jacks for elevation of the frames. The result, states the manufacturer, is more accurate elevation. One jack, powered by an electric motor can lift 50 tons, 8 in. in 60 sec, at touch of a push button, it is claimed.

Self-locking worm gear jack is said to eliminate slipping or creeping under load. Jacks range in capacity from 5 to 50 tons, depending on model in which they are used. Raise varies 8 to 30 in. *Worthington Corp.*

Circle No. 10.

Weldor's headgear

PLASTIC headgear is for welding helmet. The "R" headgear is said to be made from toughest plastic known and will stand extreme temperature conditions.

Special feature is plastic sleeve which encloses the gear teeth in ratchet part of the assembly. Sleeve is closed so that gear teeth are not exposed, preventing grease or dirt from entering operating mechanism. Plastic band which can be bent, creased or, flexed is another feature. *Sellstrom Mfg. Co.*

Circle No. 11.

Grinding wheel

FASTER, cooler-cutting, grinding wheel is for use in aviation and automotive industries. Non-premium vitrified wheel is for cylindrical grinding on cam shafts and other center-held grinding operations. Wheel is available in wide range of sizes from tiny internal wheels to 36-in. cam shaft units. *Electro Refractories & Abrasives Corp.*

Circle No. 12.

Flash trimmer

HYDRAULIC flash trimmer is for high speed production trimming. Unit trims inside and outside of butt welded rings from 5 in. diameter up, having 1/8-in. maximum thickness. Trimmer has 8 in. stroke.

Twin arms operated hydraulically give automatic work ejection. Three tool holders and cutting tools are provided in each ram. Cutting cycle is automatic through floor, foot-type starting switch. *Morton Mfg. Co.*

Circle No. 13.

Galvanizer

COLD galvanizing compound is said to prevent rust, protecting iron and steel surfaces. It is reported ideal for repairing damaged galvanizing. Termed "Drygalv," it may be applied with either brush or spray gun, producing a coating with a high proportion of metallic zinc—approximately 95% in the dried film.

Compound is nontoxic, drying to the touch in 15-30 minutes; can be second-coated or painted in 8 hours, it is reported. It will withstand temperatures to 392 F, for a limited time. *American Solder & Flux Co.*

Circle No. 14.

Electrode holder

FEATURE of electrode holder is aluminum construction, reducing weight. The "AL-300 Twecotong," weighs 13½ oz. Holder has tips and body insulation of laminated glass cloth. Upper and lower jaws are replaceable. They are made of copper, cadmium plated to resist corrosion and to prevent weld spatter sticking to the jaws, states manufacturer.

Welding cable is attached by baring cable end and inserting in reamed hole in holder body. Cone-shaped screw holds cable securely in position. Connection works equally well on either aluminum or copper cable. *Tweco Products, Inc.*

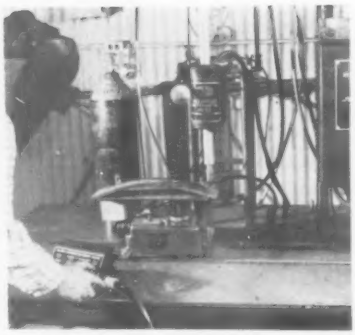
Circle No. 15.

Electrode

FOR a-c or d-c operation, all-position "Hobart 212" electrode is said to produce very little spatter. It is designed for fast production and fabrication welding, can be used for maintenance welding. It is recommended for use where fit-up is poor.

Electrode is available in 1/8, 5/32, 3/16, 7/32 and 5/16 in. sizes packed in 50 lb packages and 3/32 in. size in 25 lb. packages. *Hobart Bros. Co.*

Circle No. 16.



Welding head

AUTOMATIC Tig (tungsten inert-gas) welding head is said to provide a completely automatic weld cycle. The "Model C" head has a single switch which causes the holder to move downward and start the arc. Arc length is maintained constant throughout the weld.

Electronically controlled, unit is primarily for d-c Tig (Tungsten inert-gas) welding, using argon or helium. Assembly has a head with a 32-in. machine holder, able to use electrodes from 0.040 to 5/32-in. diameter, up to 24-in. long. Unit also has a main control panel, and a remote control operator's station. Head can operate in either horizontal or vertical (normal) position. Holder can be tilted by micro-positioner, 6 deg either side of center. *Air Reduction Sales Co.*

Circle No. 17.

Solder microform

NEED for purity in solders used to join parts of transistors, diodes and other semiconductors is claimed to be met by series of solder microforms. Microforms contain rare metal elements ranging in purity to 99.999 +.

Solders available include indium, tellurium, gold, platinum, silver, aluminum, arsenic, bismuth, cadmium, copper, tin, zinc and lead. Microforms can be obtained with just one or in a wide selection of combinations. Present forms of solder materials include crystals, cast cake, continuous cast rod, extruded, and cast stick, pellets, washers or wire. *Anchor Metal Co., Inc.*

Circle No. 18.

Power source

INDUCTION motor model "2900" is rated at 1/100 to 1/15 hp. The motor incorporates an improved 24-slot lamination. The motor is said to give longer motor life, longer bearing life, less lubrication trouble, with ability to operate in higher ambients. *Howard Industries, Inc.*

Circle No. 19.

MUREX® SPEEDEX HTS

TYPE E-7016

For all-position welding, of hard-to-weld steels

Low hydrogen–iron powder electrodes for low alloy, high tensile steels, MUREX SPEEDEX HTS electrodes deposit more pounds of weld metal per hour than conventional electrodes. They are preferred for a variety of hard-to-weld metals, where welding speed and strength are important and underbead cracking must be minimized or eliminated.

- SPEEDEX HTS gives a quiet, steady arc with good penetration.
- SPEEDEX HTS deposits are easily controlled . . . slag is light and friable.
- SPEEDEX HTS produces porosity-free welds that will readily pass radiographic inspection.

For further information on this or the complete line of Murex electrodes, machines and accessories, write or phone—there's an office near you.

WELDING SUPPLIES
RADIOGRAPHIC EQUIPMENT
PLATING MATERIALS
ORGANIC COATINGS
CERAMIC MATERIALS
TIN & TIN CHEMICALS
METALS & ALLOYS
HEAVY MELTING SCRAP

METAL & THERMIT
CORPORATION
GENERAL OFFICES: RAHWAY, NEW JERSEY

SIL-BOND
PHOSON

United's Brazing Alloys

Easy To Use

Super Strength

Meets

All Specifications

For mass production, or single purpose jobs . . . you're right every time when you braze with United's Phoson or Sil-Bond and low-temperature Sil-Flux. A brief glance at the chart below will show you how United's brazing alloys and Sil-Flux conform to all standard specifications, and are so certified!

See Standard Specs These Alloys Meet!

Name	MILITARY S-15395 (was Navy 47-S-13a)	FEDERAL QQS-561-d Army Chem. Warfare 196-131-80	Aero Mat'l Spec.	ASTM B260-52T & AWS A5-8-52T	U. S. Army 57-97-1A	% Silver	Solidus °F	Liquidus °F
Sil-Bond 50	IV	4	4770B	—	—	50	1160	1175
Sil-Bond 50N	V	5	—	BAg-3	—	50	1195	1270
Sil-Bond 45	VII	—	—	BAg-1	7	45	1125	1145
Sil-Bond 35	VIII	—	—	BAg-2	8	35	1125	1295
Sil-40N	—	—	—	BAg-4	—	40	1220	1435
Sil-45	1	1	—	BAg-5	—	45	1250	1370
Sil-50	—	—	—	BAg-6	—	50	1275	1425
Sil-56T	—	—	—	BAg-7	—	56	1145	1205
Sil-72	—	—	—	BAg-8	—	72	1435	1435
Sil-65	11	2	—	BAg-9	—	65	1280	1325
Sil-70	—	—	—	BAg-10	—	70	1335	1390
Sil-85M	—	—	4766	BAgMn	—	85	1745	1760
Sil-54N	—	—	4772	—	—	54	1325	1575
Sil-20	—	—	—	—	—	20	1430	1500
Sil-20C	0	0	—	—	—	20	1140	1500
Sil-9	—	—	—	—	—	9	1510	1575
Phoson-15	111	111	—	BCuP5	—	15	1185	1500
Phoson-6	—	—	—	BCuP4	—	6	1185	1480
Phoson-0	MIL-C-20158 (was 47C3)	—	—	BCuP2	—	0	1305	1485
Sil Flux	51F4A	Air Force MIL-F-4483	AMS 3410	—	4-1121	—	FLUID 1100°F-1600°F	

Quality-control production from alloying to finished forms of wire, rod, ring strip and powder

Free! fully-illustrated catalogs and price sheets.

Permanently United

UNITED WIRE

AND SUPPLY CORP.

Brazing Alloy Division

PROVIDENCE 7, R. I. — OFFICES IN PRINCIPAL CITIES

LOOK TO UNITED FOR THE BEST IN ALUMINUM, COPPER AND BRASS TUBE AND WIRE.

Pipe cutter

PORTABLE flame-cutting and pipe beveling machine is for small-diameter pipe (1½ to 4 in.) Model "O" is said to assure square bevels, can be operated easily and efficiently. It weighs 7½ lb.

Machine can be placed on continuous pieces of pipe. To use on different pipe sizes merely requires changing precision-made adapters, for particular pipe size. Any plain-barrel machine cutting torch may be used with unit, it is reported. *H & M Pipe Beveling Machine Co.*

Circle No. 20.

Brazing

CASTABLE ceramic, "Sur-Braze Grade S," used in brazing jigs and fixtures, is now available in bulk 5-lb cans with complete casting instructions. Ceramic can be molded into brazing jigs and fixtures.

Ceramic is said to be particularly suited for use in brazing symmetrical tubular assemblies. Ceramic is also available in standard 4 by 8 in. by 1¼ in. jig block. It is suitable for operating temperatures to 1,800 deg. *Technion Design & Mfg. Co.*

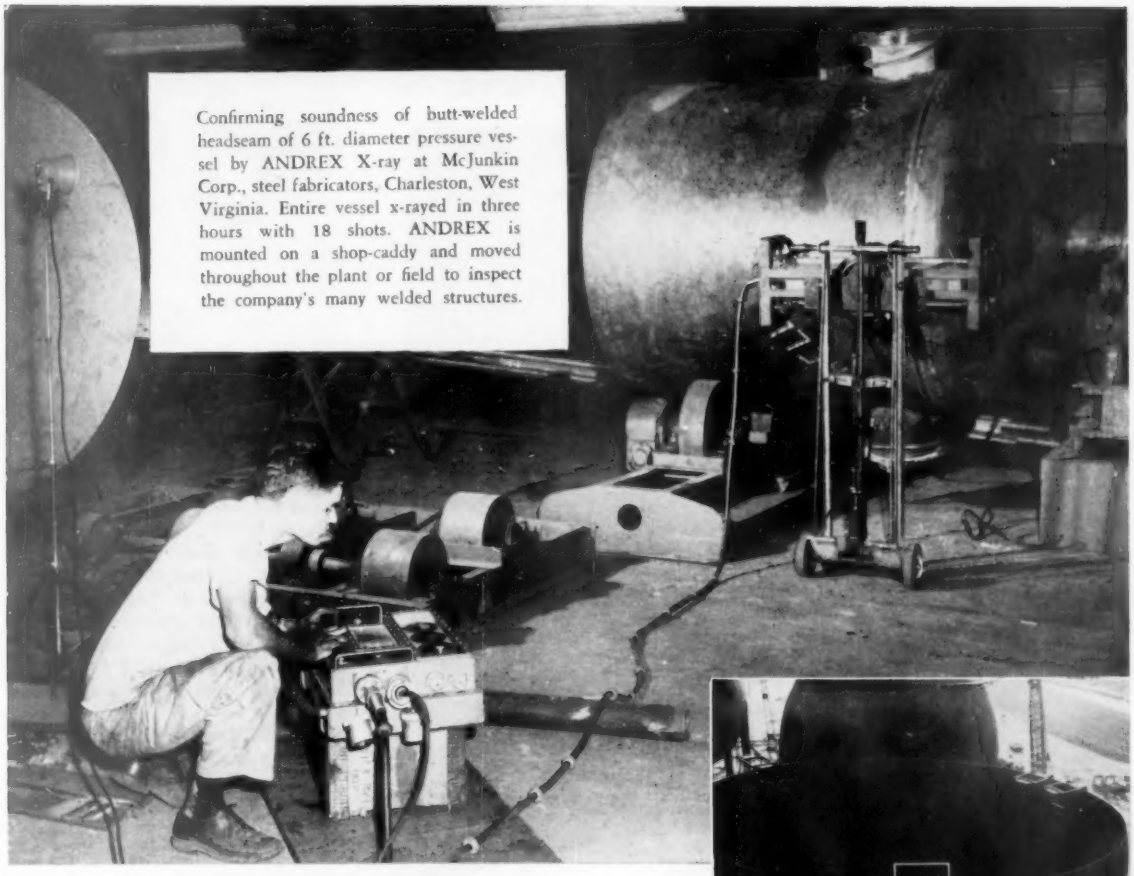
Circle No. 21.

Abrasive segment

FERROUS and nonferrous metals can be ground by "V-40" bond abrasive segment. It is made of aluminum oxide abrasive grain in a variety of shapes for standard chucks. Segment is particularly suited for generating flat surfaces on plates, castings and machine parts.

Abrasive segment is claimed to have cool cutting action, long life and good size-holding ability. Waterproof pad, applied to segment with resilient cement, assures better holding power in chuck, states manufacturer. *The Carborundum Co.*

Circle No. 22.



Confirming soundness of butt-welded headseam of 6 ft. diameter pressure vessel by ANDREX X-ray at McJunkin Corp., steel fabricators, Charleston, West Virginia. Entire vessel x-rayed in three hours with 18 shots. ANDREX is mounted on a shop-caddy and moved throughout the plant or field to inspect the company's many welded structures.

ANDREX PORTABLE X-RAY

non-destructive inspection of welded metal structures . . . fast, thorough, economical

X-ray, the preferred method of controlling weld quality, can be applied to plant and field work with the truly portable ANDREX unit. It is a compact unit consisting of a simple-to-operate control panel and an X-ray head that can be quickly and easily positioned anywhere. It provides a film record which either confirms the soundness of the weld or shows up both the nature and location of any hidden defect. Penetrating power is ample for practically all structures. Already in widespread use throughout the world, ANDREX is thoroughly dependable with over 2½ years of maintenance-free service being commonplace.

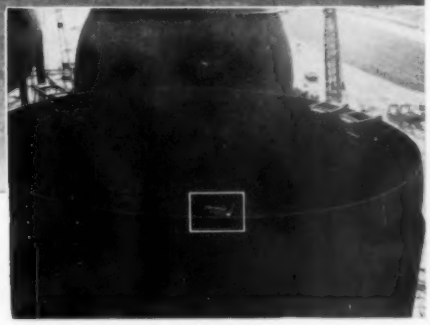
Write for further information on ANDREX X-RAY

•

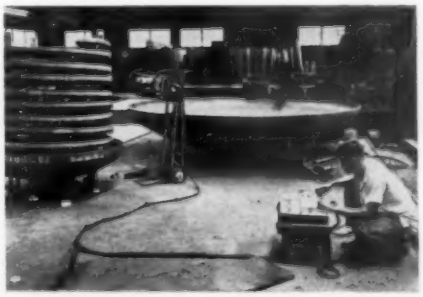
Pioneered, sold and serviced by

HOLGER ANDREASEN, INC.

703 Market Street, San Francisco 3, Calif.
Chicago office: 4142 W. 63rd St., Phone: POrtsmouth 7-5255
Canadian representatives: Non-Destructive Testing Corp., Ltd.
983 Bay, Toronto 5, Canada

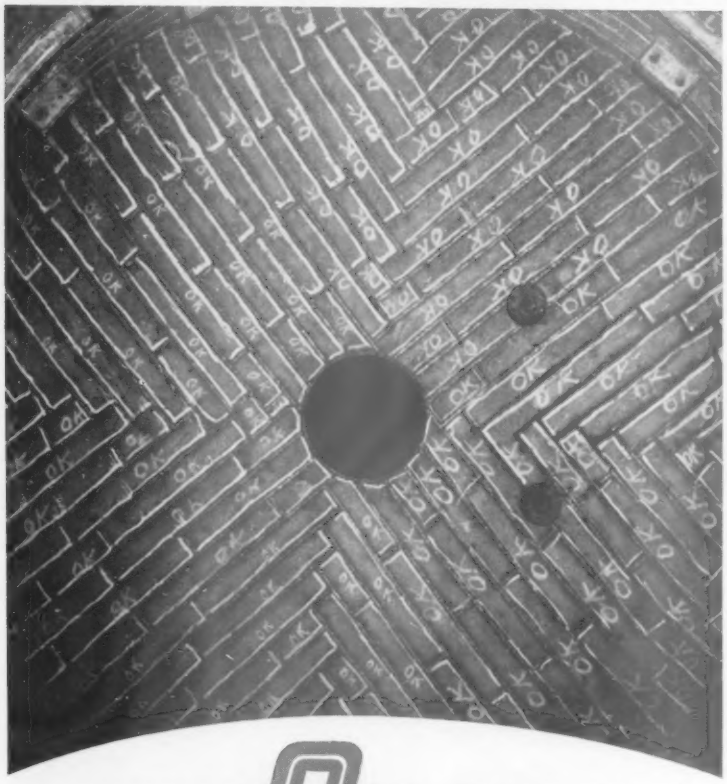


Maintaining quality control with 17,971 ANDREX X-ray pictures during construction of Hortonspheres for Calumet Nitrogen Products Co. by Chicago Bridge and Iron Co. 2000 to 2500 pictures per week taken at night so as not to interfere with work. ANDREX is mounted inside sphere and areas are traversed by turning machine slightly for successive pictures. As all pictures are taken under same condition, quality is constant.



ANDREX, in a setup similar to this one at McJunkin Corp., examines internal stainless steel coils for pressure vessels at Texas Pipe Bending Co., Houston, Tex.

How to get the "OK" on stainless welds . . . time after time



WELD WITH ARCOS

STAINLESS ELECTRODES

On weld after weld—such as in this refinery tower lining which must resist intense corrosion—Arcos quality controlled electrodes will give you the "right" weld metal . . . easily deposited. If you are looking for sound, low cost, long-life welds—you can rely on Arcos *ELECTROPAKED* Electrodes to produce unquestioned "OK's" time after time. ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.

Weldor's helmet

STRONG lightweight weldor's helmet is designed for maximum protection and comfort. Lift-front type helmet has metal lift front, insulated on inside of helmet.

Termed "No. 668-9," helmet is sturdy shell, made from a flat sheet of fiber, with deeply lapped seams sealed by oversize rivets. Shell has narrow straight portion for close quarters, with sides extended for maximum protection from side flashes. Headgear has two positive stops, two position joints equalizing movement. Ratchet adjustment is for good fit; sweatband is replaceable. *The Fibre Metal Products Co.*

Circle No. 23.

Thyratron

THYRATRON is for grid-controlled rectifier service. It is designed to provide service where shock, vibration and other causes of tube failure are present.

Unit is Xenon-filled, shield-grid type. Termed "2050W," design features include external vibration insulation of silicone rubber between base and bulb, durable ceramic beads and double mica mount supports. *Chatham Electronics.*

Circle No. 24.

Leather sleeve

ARM sleeve "Sleevelet No. 5218" is made of heavy weight auburn-brown cowhide. Sleeve has take-up strap at top and snap fasteners at the wrist. Sleeve fits contour of the arm, is designed to allow freedom at the elbow. Sleeve is available in 12, 15 or 18-in. length. *John Tillman & Co.*

Circle No. 25.

Arc welding gun

SPOT arc welding gun is for sheet metal fabrication and automobile body repair. Simple in design and safe to operate, portable gun will not distort metal, it is said.

Gun weighs 2 lb, has plastic body, is insulated and shockproof, manufacturer states. Automatic trigger feed produces 15-18 spots per 9 in. of welding wire. During continuous welding, gun barrel can be cooled by dipping in water. Gun can be used only with electric arc a-c or d-c welder with capacity of 150 amp or more. Used with 5/64 or 3/32 diameter of 9-in. long electrode. *Spot Arc Gun Sales Co.*

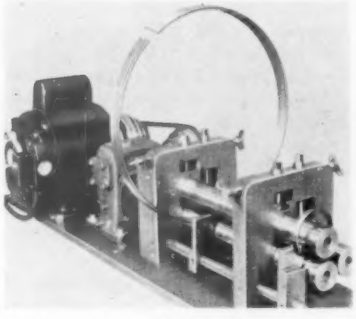
Circle No. 26.

Generator

FRACTIONAL hp induction motor has open self-ventilated frame. Termed "Model 9200," it is available for pad, resilient ring or end mounting.

Rating range (continuous duty) is: permanent split capacitor single phase, 50, 60, 120 cycle. For 2, 4, 6 poles induction: 1/150 to 1/50 hp; 2, 4, 6 poles synchronous: 1/250 to 1/60 hp. Polyphase (2 or 3 phase) at 50, 60, 120 cycle: 2, 4 poles induction: 1/150 to 1/60 hp; 2, 4 poles synchronous: 1/250 to 1/80 hp. *Howard Industries, Inc.*

Circle No. 27.

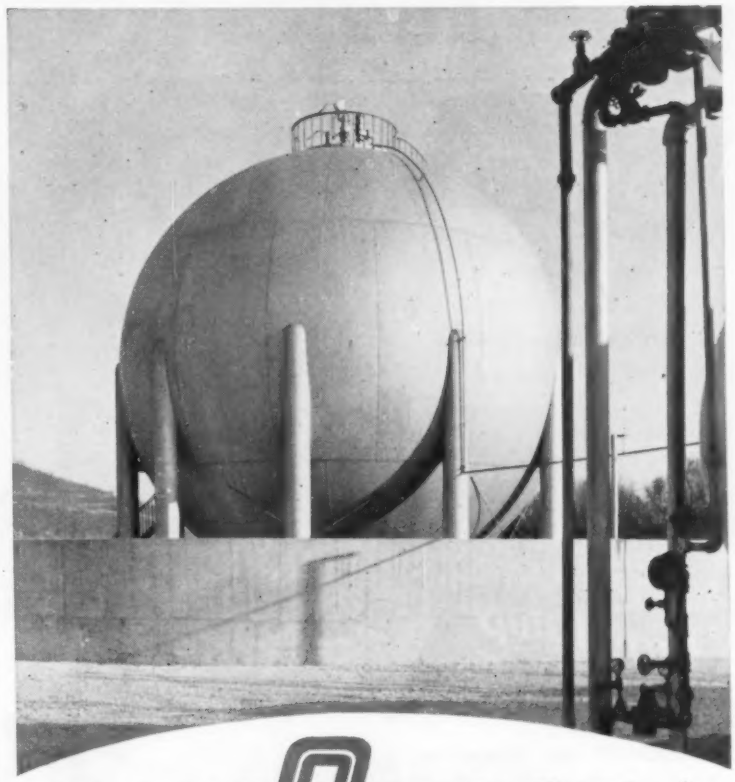


Wire ring roller

WIRE ring roller can roll rings of round or flat wire, from 2-30 in. diameter. It is powered by ½ hp motor which will take care of five 3/16-in. diameter wires. *Penn Machinery Co.*

Circle No. 28.

For speed, economy and dependability when welding low-alloy steels...



WELD WITH ARCOS

LOW HYDROGEN ELECTRODES

When welds *must be strong*—as in the Hortensphere* pictured above—ARCOS Low Hydrogen Electrodes will do the job. Usable in all positions, they produce uniformly high quality welds to meet the most rigid inspection standards. Time and money will be saved by eliminating preheat and by avoiding costly repair welds. ARCOS CORPORATION, 1500 South 50th St., Philadelphia 43, Pa.

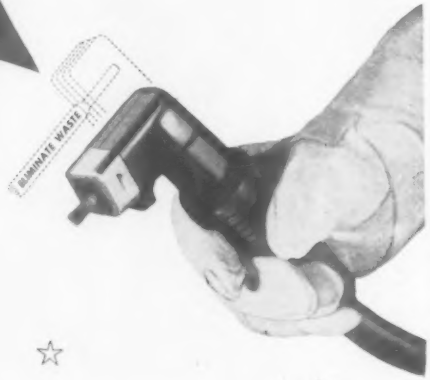
*Trademark registered by Chicago Bridge & Iron Co.

BERNARD

(PIONEER FOR MODERN WELDING)

"Shortstub" ELECTRODE HOLDER

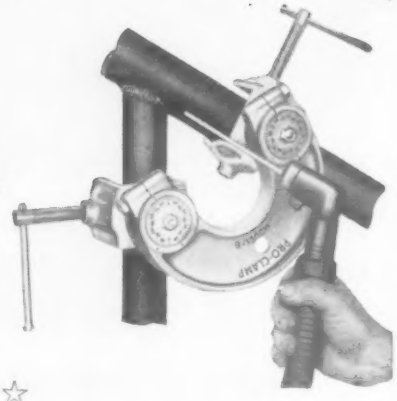
The jaws substitute for stub waste by splicing a 2 inch extension to the length of every electrode.



☆

"Pro-Clamp" MECHANICAL HANDS

MODERNIZE the fabrication of plates, shapes, rods, bars, pipes, etc. MAKE fitting, positioning, holding, and welding a fast, accurate, inexpensive, one-man job.



☆

"Multi-Pic" CONTOUR CLEANER

Delivers FIVE surface cleaning blows with each swing and lasts FIVE times longer than single headed hammers.

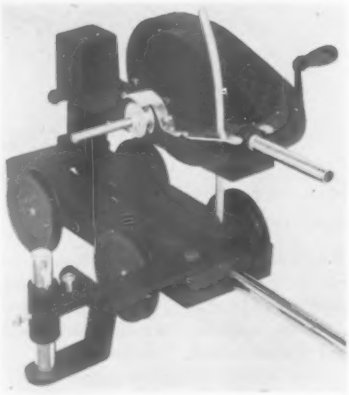
HAS 5 CONTOUR FORMING HEADS WHICH MEANS 5 TIMES FASTER CLEANING ACTION.

See Your Local Dealer, or, Write for Bulletins, SS-3, MP-6 and PCB-6

Manufactured By

BERNARD WELDING EQUIPMENT CO.

10232 AVENUE N, CHICAGO 17, ILLINOIS



All-purpose beveler

LIGHTWEIGHT all-purpose machine is known as "Bevel-rite." Although the machine is light (33½ lb), it is ruggedly built and can handle pipe from 2-24 in. diameter, states manufacturer.

The "Bevel-rite" can be set to roll the pipe while cutting or if pipe is stationary, machine can move around pipe. Machine can also handle plate. Operating mechanisms are housed for full weather protection. *Contour Marker Corp.*

Circle No. 29.

RW seam welder

RESISTANCE seam welder is designed to weld a range of critical metals down to 0.002. A bench-type welder, this "Type OS" welder is a standard model, formerly available only in special designs.

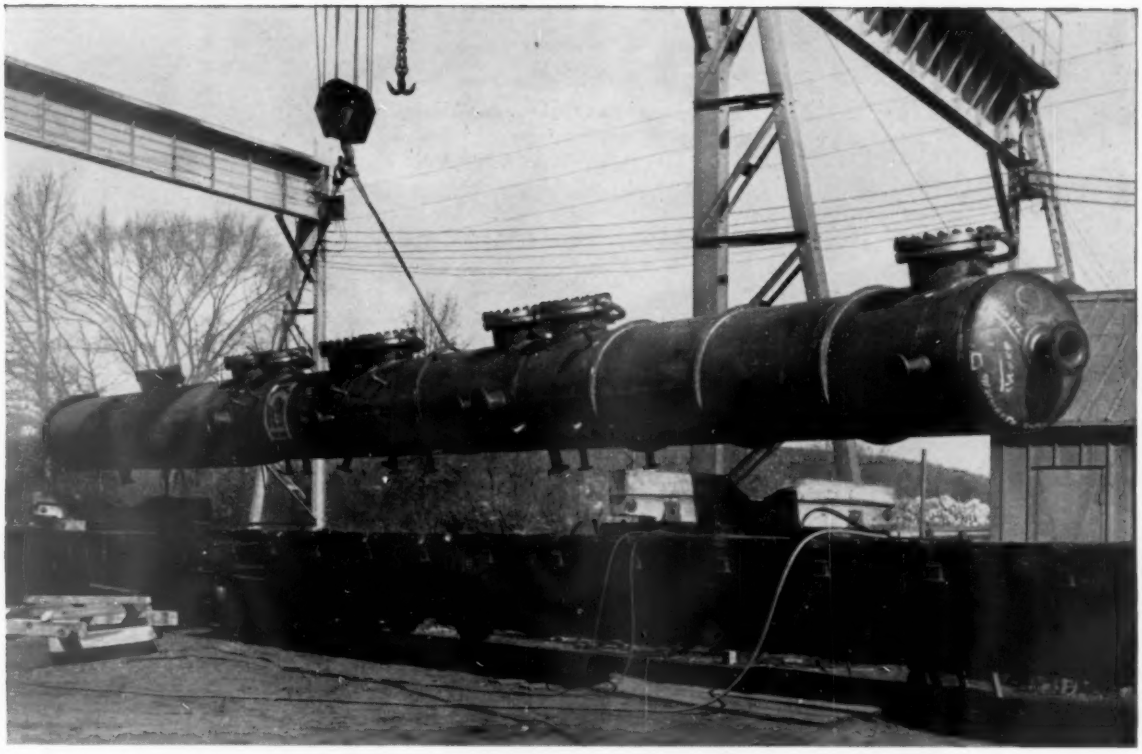
Unit has adjustable welding current and pressure. Gage limits are from 0.002 to 0.020. Welder has narrow frame; a sub base permits floor mounting. Five electrode wheel drives are available. It can be equipped with circumferential, longitudinal or universal welding gear arrangements. Applications include welded assemblies for diaphragms, electron tubes, and other components requiring precision welding of thin, critical metals. *The Taylor-Winfield Corp.*

Circle No. 30.

LP gas Engine

LPG and natural gas conversions of Jeep L-Head and F-Head industrial engines can be had as optional equipment. Use of hardfaced valve inserts, water cooling of manifold, plus LPG carburetor and regulator equipment make the Jeep engine suitable for burning propane or natural gas. *Willys Motors, Inc.*

Circle No. 31.



Welded with dependable

Downingtown weldors found Arcaloy Type 310 AC-DC the ideal electrode for the many welds in this vessel. Shown above they are working on the final assembly welds between the 410 clad section and the mild steel section.

ARCALOY

STAINLESS STEEL ELECTRODES

DOWNINGTOWN Iron Works, Inc.* used Arcaloy stainless steel electrodes in the fabrication of this 80′ refinery stripper tower. They chose Arcaloy Type 310 AC-DC electrodes for welding the 48″ diameter clad section and for joining it to the 42″ diameter steel section. Fabricated under API-ASME code, this vessel had to have welds of x-ray quality. The Downingtown staff knew that dependable Arcaloy stainless steel electrodes would produce these sound welds.

This stripper tower is typical of the fine products of Downingtown Iron, products that reflect the efficient planning, skilled workmanship and thorough service of this outstanding builder of equipment. Arcaloy stainless steel electrodes were *their* choice—and should be yours, too—for producing high quality weldments.

For complete information on dependable Arcaloy stainless steel electrodes, see your Alloy Rods distributor or write:

General Offices and Plant
Lincoln Highway West • YORK 2, PENNSYLVANIA

Pacific Coast Sales Office and Plant
750 Lairport Street • EL SEGUNDO, CALIFORNIA

*Division of:
PRESSED STEEL TANK COMPANY,
Milwaukee 14, Wisconsin

Alloy Rods Co.

no finer electrodes made...anywhere

a helping hand means... better rods for you

Welding rods with RUFLUX* in the coating offer worthwhile advantages. What these advantages can mean depends upon which RUFLUX product is used. For RUFLUX is a TAM* trade name which stands for the highest quality Rutiles, Titanates and Zirconium compounds.

A TAM sales engineer can give you the facts quickly and accurately. He is technically trained and is familiar with the properties of the various TAM RUFLUX products. Furthermore, he is supported by a well-equipped and staffed research laboratory offering every available assistance.

This combination offers you a helping hand to better welding rods.

TAM PRODUCTS
Registered U. S. Pat. Off.

TITANIUM ALLOY MFG. DIVISION
NATIONAL LEAD COMPANY
Executive and Sales Offices:
111 Broadway, New York City
General Offices, Works and Research Laboratories:
Niagara Falls, New York

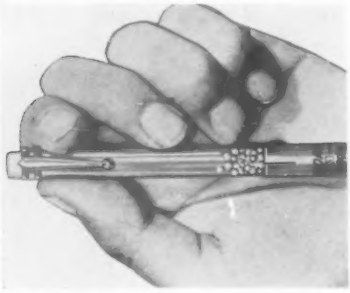
*Ruflex and TAM are registered trademarks.

Safety hat

SAFETY hat and welding goggle combination provides head and eye protection. Goggles, cover-glass style, can be worn over personal glasses. Adjustable for pupilary distance, goggles have individual cup action for perfect fit.

A mounting bracket on the "Supergard" hat allows the goggle to be raised and lowered without readjustment. Bracket also allows goggle to be worn slightly off-face. Hat has full floating, plastic headgear. Headsizes are adjustable from 6½ to 8. *Boyer-Campbell Co.*

Circle No. 32.



Radiation detector

EXPOSURE radiation detector, "Radad" dosimeter, is said to provide protection against excessive radiation exposure. The dosimeter gives cumulative measurement and instantaneous reading of dangerous amounts of exposure to gamma rays.

The unit consists of a hollow, hermetically-sealed ionization chamber, containing Polystyrene beads which serve as indicators. These beads are electrostatically charged by shaking the tube. The detector can be carried in the pocket. When dosage approaches limit, beads lose their charge, dropping to bottom of chamber. The "Model 523F" is calibrated to detect 50 Roentgens exposure, "Model 523M" to detect 25 Roentgens. *Pacific Transducer Corp.*

Circle No. 33.

Largest Monel press roll ever built is fabricated by welding three 120° sections of plate together.

Sound from end to end

60 feet of welding in 2¾-inch-thick Monel shows "not the slightest evidence of porosity"

High-speed paper mills pay a pretty penny for every minute of downtime. Yet, with an ordinary suction press roll, they have to ream thousands of holes and refinish the surface as often as every ninety days.

Right now several mills are operating Monel* rolls that have gone *more than three years without being touched.*

Welding a super press roll

Fortunately, fabrication of these super Monel press rolls presents no problem. Even in the case of giants like the one shown here, it's done simply and *soundly* with "130" Monel Electrodes.

This job was handled by the Youngstown Welding & Engineering Company. And it was a big job . . . *but literally!* Three 2¾-inch-thick by 38-inch-wide by 240-inch-long plates had to be joined to form the roll. Together they weighed nearly 12 tons.

700 lbs. of Electrode

The Youngstown people spent 500 hours welding this roll and used 700 lbs. of 3/16 inch diameter "130" Monel Electrodes for the three seams – 60 feet of 2¾-inch-thick weldment!

After each pass they made close inspection visually and with a flaw-detection penetrant. A final check was made by machining the roll surface and boring a little less than half way through the welds at various spots.

No porosity

Youngstown reported this final check "did not reveal the slightest evidence of porosity." Welding with "130" Monel Electrodes had proved a highly satisfactory method of fabricating. The three welds are as strong as the parent metal and *just as corrosion-resisting* . . . that counts in the mills.

Maybe you have a welding job coming up, a job on Monel nickel-copper alloy, Nickel or one of the other high nickel alloys. Use INCO Electrodes for best results. They're easy to work with. Write for the whole story in Technical Bulletin T-2, *Fusion Welding of Nickel and High Nickel Alloys.*

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.
*Registered trademark

Joining nearly 12 tons of Monel nickel-copper alloy to form this giant press roll took 500 hours of welding and 700 lbs. of Inco "130" Monel Electrodes.

INCO TRADE MARK **Welding Products**
Electrodes • Wires • Fluxes

Consult
EISLER

FOR GENERAL WELDING EQUIPMENT

Eisler Spot Welder No. 250-VDAS

Eisler Indexing Turntable No. 88-GT-8

Eisler designs and manufactures spot welders from 1 KVA as well as a complete range of butt, saw and band welders and other welding equipment, including indexing turntables — standard, or to your order, electric or gas soldering and brazing machines.

Manufacturers' representatives wanted

EISLER ENGINEERING CO., INC.
Charles Eisler, Jr., President
749 SO. 13TH ST., NEWARK 3, N. J.

Hose crimper

No bigger than a pair of pliers is self-contained hose ferrule crimper. Tool has toggle action similar to heavyduty grip pliers. It is said to have 2,000-lb pressure on crimping dies with one-hand squeeze. Jaws are released with fingertip release lever.

Crimper can be used to splice hose or install connectors on air or welding hose. Two sizes available to crimp 3/16 or ¼-in. hose ferrules. *Heidt Equipment Co.*

Circle No. 34.

Hold-down clamp

TELESCOPING feature of hold-down clamp adjusts up and down to fit wide range of work. Termed the "QK" clamp, it is said to eliminate using different T-bolt lengths for varying work heights. One end of clamp is of conventional design, other end is designed to fit into small slots and recesses.

Full thread engagement is maintained by the stopping action of snap-ring on end of T-bolt. Threaded holes in both ends of the clamp permit leveling of either end. Clamp is available in 6 sizes with smallest telescoping from 9/16 to 27/16 in.; the largest from 2¼ to 5¾ in. *Jergens Tool Specialty Co.*

Circle No. 35.

Grinding control

ACCURATE control for grinding close tolerance tapers is purpose of "Swivalign" dual electric indicator. Indicator measures swivel table adjustment.

Device can be used on cylindrical and universal grinding machines. It consists of one electrical pick-up unit with zero adjusting knob at each end of swivel table. A two-channel amplifier has pair of indicating meter elements reading on a common scale. Each meter needle responds to movements of only one of pick-up elements. *Norton Co.*

Circle No. 36.

Tempilstik°

FOR ALL HEAT-DEPENDENT OPERATIONS

looks like a crayon... marks like a crayon... tells temperatures like a precision instrument!

Available in these Temperatures (F.)

113	375	1000
125	388	1050
138	400	1100
150	413	1150
163	425	1200
175	438	1250
188	450	1300
200	463	1350
213	475	1400
225	488	1450
238	500	1500
250	550	1550
263	600	1600
275	650	1650
288	700	1700
300	750	1750
313	800	1800
325	850	1850
338	900	1900
350	950	1950
363		2000

Sixty-three different compositions enable you to determine and control working temperatures from 113° to 2000° F.

TEMPILSTIK° marks on workpiece "say when" by melting at stated temperatures — plus or minus 1%.

ALSO AVAILABLE IN LIQUID AND PELLET FORM . . . WRITE "WELDING SALES" DEPT. FOR SAMPLE TEMPIL° PELLETS . . . STATE TEMPERATURES OF INTEREST—PLEASE!

Tempil° CORPORATION 132 WEST 22ND STREET, NEW YORK 11, N. Y.

NEW PRODUCT BRIEFS

Vise jaw face plates are rubber-faced; are offered on vise sizes from 2 to 6 in., including ¼ in. sizes. Rubber is bonded to aluminum bodies, protects yet is firm enough to hold rigidly, states manufacturer. *The Kenimar Corp.*
Circle No. 37.

Porous stainless steel filter element, combined with cotton packing, is for removal of micro-organisms from gases. Units can handle large or small gas flows at very low pressure differentials, it is claimed. *Micro Metallic Corp.*
Circle No. 38.

Tubing is recommended as sleeving for electrical wiring applications where high temperatures occur. "Teflon" tubing has high dielectric strength and insulation resistance. *Tensolite Insulated Wire Co., Inc.*
Circle No. 39.

Powerful, built-in, permanent magnets holds level on work without use of hands. "Magno-Level" is said to hold securely on ferrous metals at any angle on either flat or curved surfaces. *Richards Merchandising, Inc.*
Circle No. 40.

Layout wheel provides both a measuring wheel and conversion chart on wheel face. Radial pointer is movable wheel face. *Idex Mfg. Co.*
Circle No. 41.

Speed reducer "No. 8" is shaft-mounted; capacity is 60 hp at 100 rpm; can be mounted on shafts to 5-in. diameter. "No. 11" has capacity of 1.3 hp at 100 rpm. Reducers are mounted directly on shaft. *Dodge Mfg. Corp.*
Circle No. 42.

Combination level and angle finder has aluminum case, is light and durable, anti-magnetic and dustproof. *Jiffy Tool Supply Co.*
Circle No. 43.

Gage attaches to circular form tools indicating correct cutting angle automatically. Designed for fast, accurate sharpening in offhand and machine grinding. *Sperco Tool Co.*
Circle No. 44.

Pressure switch "Meletron model 432" signals when pressure rises or falls and shuts down system at danger level. Available in three classes of proof pressures, 6, 30 and 120 psi. *Barksdale Valves.*
Circle No. 45.

Turned by rotary electric and air drills, 11 tungsten carbide-tipped masonry drills have been added to "Porto" line. Drills are both solid-cutter and hollow-core types. *Plomb Tool Co.*
Circle No. 46.

Selector switch is for applying power to multi-furnace, high-frequency, induction-melting installations. *Inductotherm Corp.*
Circle No. 47.

Jaws of "Kant-Twist" clamp are grooved on one face, serrated on opposite face. Clamp is 9 in. heavy-duty type. *Saxton Mfg. Co., Inc.*
Circle No. 48.

For more information use card on page 91

New . . . Better . . . Easier for operators

PRECISION'S TUF-CUT SAUCER

Always maintains the correct grinding angle . . . and does it automatically!

SPEEDS

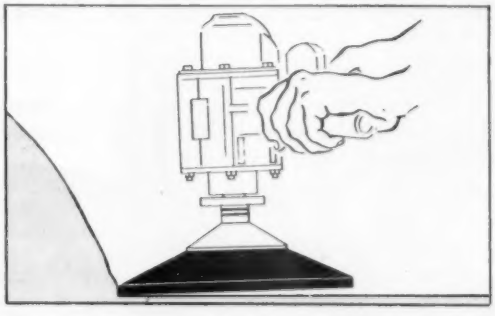
Recommended safe operating speeds are:
7" diameter—6000 RPM
9" diameter—5500 RPM

STOCKS

Standard grades of SAUCERS are available in these sizes:
7 x ¼ x ⅞ 9 x ¼ x ⅞

ADAPTORS

For safe operation, use the TUF-CUT SAUCER Adaptor, Catalogue TC-2.



See how the operator assumes a comfortable position . . . how it eliminates fatigue . . . how easy it is for him to get maximum efficiency . . . BECAUSE he does not have to tilt THE SAUCER WITH THE **BUILT-IN** GRINDING ANGLE.

For:

FOUNDRY MEN

WELDERS

SHEETMETAL MEN

PRECISION

GRINDING WHEEL COMPANY, INC.

PHILADELPHIA 36, PENNSYLVANIA

"FLUX-WELL"

Welding Fluxes

No. 1—WELDING FLUX
For Cast or Malleable Iron

No. 2—BRAZING COMPOUND
For Brass, Bronze, Steel Brazing

No. 4—ALUMINUM FLUX
For Cast or Sheet Aluminum

No. 5—BRAZING COMPOUND
For Cast or Malleable Iron

Write for Free Folder!

Weld Rod Division

THE CHICAGO HARDWARE FOUNDRY CO.
NORTH CHICAGO, ILL.

NEWS . . . . . *from page 6*

tive needs of titanium. The firm now produces titanium wire for use in welding.

Edward R. Funk, president and treasurer, was formerly associated with Goodyear Aircraft Corp. James H. Johnston, vice-president and chairman of the board, is vice-president of Johnston Stainless Welding Rods firm of Los Angeles. Buford R. Riffee is plant manager.

Plywood panel is porcelain faced

A porcelain-faced plywood panel, reported ideal for both industrial and home use, has been developed by the United States Plywood Corp., New York City.

The new panel, termed "Porc-Lin-Ply," is composed of a 30-gage, 0.012 in. steel face, treated with two coats of porcelain, fused under 1,600 deg heat to achieve a hard, semi-matte finish. The core is of ¼ in. exterior grade plywood.

A metal backing gives balance to the panel which weighs only 1.75 lb per sq ft. The new panel is claimed easily applied and readily worked.

The panel size is 36 by 96 in. 5/16 in. thick; nine colors are available. The panel is said to be weatherproof, moisture resistant, and resistant to ordinary acids, oil, grease, smoke and solvents. It may be cleaned by wiping with a damp cloth.

Midwest distributor opens new store

James F. Paterson, welding distributor of Aurora, Ill., has opened a new store at Sixth and Main Sts., Kewanee, Ill. To celebrate the opening a welderama and open house was held May 23 and 24.

Representatives of welding equipment manufacturers presented exhibits and continuous welding and cutting demonstrations. In addition there were films of new products and processes as well as displays of latest equipment.

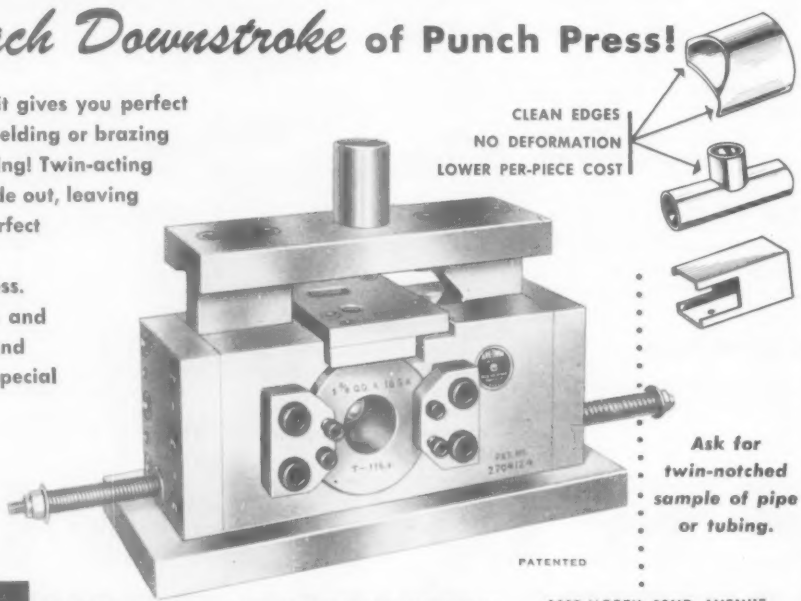
Carboloy moves West Coast office

The Pacific district office of the Carboloy Department of General Electric Co., Detroit, has moved to new quarters at 2106 W. Washington Blvd., Los Angeles. The office was formerly located at 5905 Pacific Blvd., Huntington Park, Los Angeles.

the ARC-TWIN *Double Notches* Pipe and Tubing with *Each Downstroke* of Punch Press!

SAVING both time and cost, it gives you perfect T-joints—instantly ready for welding or brazing without deformation or finishing! Twin-acting punch shears clean, from inside out, leaving two matching notches (in perfect 180° alignment) with every downstroke of the punch press. Quickly interchangeable dies and punches accommodate pipe and tubing from ½" to 2⅜" O.D.; special units, up to 3" O.D.

Special Arc-Twins for double notching stainless steel or monel metal and units built to your specifications can also be furnished.



Ask for twin-notched sample of pipe or tubing.

VOGEL TOOL AND DIE CORPORATION

1805 NORTH 32ND AVENUE
MELROSE PARK, ILLINOIS

Penn Salt expands manufacturing

The Pennsylvania Salt Mfg. Co., Philadelphia, has announced expansion of chlor-caustic facilities at its Calvert City, Ky., works. The expansion is expected to increase chlorine production from 50 to 150 tons a day with accompanying increase of rayon-grade caustic soda. Construction is scheduled for the near future with operation to begin next year.

CGA to hold summer meeting

The summer meeting of the Compressed Gas Association, New York City, will be held at the Seaview Country Club, Absecon, N. J., June 27, 28 and 29. Committee meetings will be held June 27 and the morning of June 28. The executive board will meet June 28.

Navy develops new metal alloy

Unusual properties are ascribed to new metal alloy recently developed by the U. S. Naval Ordnance Laboratory, White Oak, Silver Spring, Md. The alloy, termed "Thermenol," is claimed 20 to 25% lighter than stainless steel and is reported to possess better tensile strength at high temperatures. Corrosion and oxidation resistance of the new alloy is said to be excellent. It is also reported to have good magnetic properties.

Because of its high tensile strength, "Thermenol" offers promise as replacement for stainless steel in turbine blades of jet aircraft engines, tail pipes and in many other applications where temperature and corrosive atmospheres present a problem. The metal, it is reported, will retain indefinitely a mirror-like high gloss polish.

Effective engineers concern of meeting

The annual meeting of the American Society for Engineering Education will be held June 25-29 at Iowa State College, Ames. Engineering instructors from more than 150 American colleges and universities are expected to attend.

Topics to be discussed will include impact of recent research on engineering education, the college faculty crisis, engineers for nuclear industry and future trends in engineering opportunities.

6868-CE

IMPROVE WELDING QUALITY WITH THE **TONG TEST**

AC-DC
AMMETER

Now you can measure actual AC or DC welding currents without losing valuable production time. The Columbia TONG TEST is simply clamped around the electrode cable. Instantly you get an accurate ampere reading to control and maintain welding quality. Interchangeable ranges available up to 1000 amperes.

Eliminate defects . . . increase production . . . maintain valuable equipment with the low-cost Tong Test Ammeter. Write today for 8-page Catalog WE-400.

Only Tong Test Measures Both AC and DC

COLUMBIA

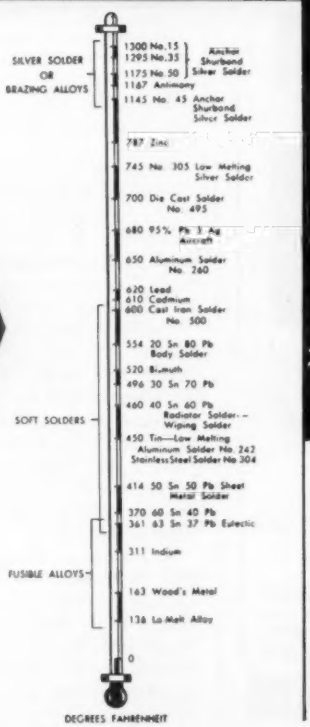
COLUMBIA ELECTRIC MFG. CO.
4551 Hamilton Avenue • Cleveland 14, Ohio

ONE SOURCE for ALL your SOLDER-JOINING needs...

ANCHOR

You do *faster, easier, safer* soldering, tinning and brazing with Anchor's *complete line* of solder products (see chart) — and you save money, too. Because Anchor has the better know-how to produce better products at lower cost to you. PROVE this for yourself, at no obligation. Fill in the coupon now.

ANCHOR Solder Alloy Selection Chart


SILVER SOLDER OR BRAZING ALLOYS
1300 No.15
1295 No.35
Anchor Shurbond Silver Solder
1175 No. 50
1167 Antimony
1145 No. 45 Anchor Shurbond Silver Solder
787 Zinc
745 No. 305 Low Melting Silver Solder
700 Die Cast Solder No. 495
680 95% Pb 5 Ag Aircraft
650 Aluminum Solder No. 260
620 Lead
610 Cadmium
600 Cast Iron Solder No. 500
554 20 Sn 80 Pb Body Solder
520 Bismuth
496 30 Sn 70 Pb
460 40 Sn 60 Pb Radiator Solder—Wiping Solder
SOFT SOLDERS
450 Tin—Low Melting Aluminum Solder No. 242 Stainless Steel Solder No 304
414 50 Sn 50 Pb Sheet Metal Solder
370 60 Sn 40 Pb
361 63 Sn 37 Pb Eutectic
311 Indium
FUSIBLE ALLOYS
163 Wood's Metal
136 Lo-Melt Alloy
0
DEGREES FAHRENHEIT

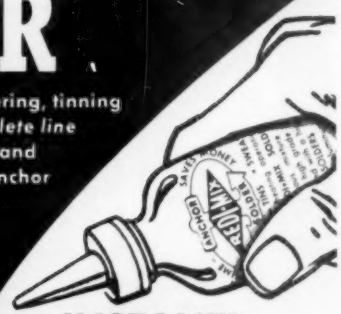
ANCHOR METAL CO., INC.
244 Boerum St., Brooklyn 6, N. Y.
HEgeman 3-8150

ANCHOR Metal Co., Inc. WE-6
244 Boerum St., Brooklyn 6, N. Y.

☐ Show me HOW TO SAVE MONEY and do BETTER JOINING with your complete line of solder products, and send FREE catalog.

☐ Have your representative call.

Name . . . . . Title . . . . .
Firm . . . . .
Address . . . . .
City . . . . . Zone . . . State . . . . .



INSTANT!...

cleaning, fluxing and soldering of all common metals, except aluminum & magnesium, without need for separate flux and solder! ANCHOR's new Redi-Mix *solder-and-flux paste in unbreakable plastic squeeze bottle — another ANCHOR* FIRST!

M38 Torch beginning cut in wooden "two-by-four". Note how intense heat envelopes head of torch.

This test proves that K-G TORCHES have "what it takes"!

Cutting through a wooden "two-by-four" is a tough test for any torch. Yet, as shown in the two photographs, our M38 Torch came through with flying colors.

Wood, unlike metal, conducts heat very slowly away from the cut. The concentrated heat reflects backward over the head of the torch. The Monel head of the M38 Torch resists distortion from this intense heat and the gas passageways remain operative.

It will be found even after such an extreme test as this that the M38 head will still take a new cutting tip. NO DISTORTION HAS OCCURRED.

If you want the best in cutting and welding torches call your K-G Distributor, or send for 24-page catalog.

Note unchanged condition of torch head after "two-by-four" has been penetrated.

The K-G Equipment Co. (Inc.)

Dept. 1744 Lehigh St., Allentown, Pa.

Alloys and Fluxes for joining and sealing

SWITCHED TO A-S NO. 13

Company Processing Sugar Beets

They Switched to Nickel-Silver for Retreading with Wear-Resisting Build-Up Metal!

They spent $23.74 *more* for 100 lb. of Nickel-Silver . . . *saved* $150.50 in other costs incident to repair of this one spindle. They repeated on 8 spindles. All-State No. 13 Nickel-Silver Build-Up Rod is now their standard for retreading.**

ALL-STATE No. 13 is Famous for Savings!

- 20 lb. saved replacement of a $1300.00 packing gland journal
- 25 lb. saved $510.00 net on finely heat-treated gears
- Hundreds other case histories of Savings

10 lb. No. 13 will start saving money for you. Comes bare or flux-coated.

**Details on request

FREE Ask for Buyers Guide. This is book full of product solutions to metalworking problems.

WALL CHART TO HELP YOU SELECT BEST FOR JOB

FROM 86 ALL-STATE PRODUCTS

Put one up in your supply room . . . another on your shop wall . . . to help guide selection of the right Alloy and Flux for the job at hand.

19" x 22" Coated Paper

Ask your A-S Distributor for Copies. He'll also give you same data in a folder to fit 3-ring binder.

ALL-STATE WELDING ALLOYS CO., INC., WHITE PLAINS, N. Y.

Welding supplier keeps up-to-date

Welding Equipment Co., Oklahoma City, Okla., recently acquired by Lowry L. Stewart, keeps well abreast of new developments in the welding field. A complete remodeling gives evidence of its progressive attitude.

A new concrete floor and new interior decorations were recently added to the firm's building. In addition, a 28-ft counter with 60 roller drawers, each drawer, partitioned for six compartments aids immediate service on small accessory sales.

Large roomy shelving behind a partition forms a backdrop behind the counter. Peg board is used for display of apparatus, accessories and safety items.

A building north of the firm's location has been utilized for inventory storage. An arc welding repair shop has been installed, equipped to service arc welding machines. Plentiful parking facilities add to customer convenience and service.

Keeping up-to-date also includes a program of personnel training. Manufacturer's training schools are attended. The firm holds weekly sales and service meetings, aimed at keeping abreast of new developments as well as coordinating employee activities.

ASTM to hold annual meeting

More than 40 manufacturers and distributors will take part in the exhibit of testing and scientific apparatus at the 59th annual meeting of the American Society for Testing Materials.

Scene of the meeting will be the Chalfonte-Haddon Hall, Atlantic City, N. J., June 17-22. On display will be hundreds of items ranging from small hand-manipulated instruments to high-temperature ovens, and universal testing machines.

Technical sessions will cover a wide variety of subjects relating to research and testing. Highlight of the 32 sessions will be a series of symposiums covering tension testing of non-metallic materials, solder manufacture and usage. Of particular interest should be sessions dicussing metals, fatigue, stainless steel and general testing.

A feature of the program will be two lectures: the Edgar Marburg Lecture by Dr. Charles E. Reed on chemical properties and applications of silicones and, the Gillett Memorial Lecture by Dr. D. K. Crampton on structural chemistry and metallurgy of copper.

COMING EVENTS

JUNE 4-7: Special Libraries Association Convention, Hotel William Penn, Pittsburgh; Metals Division program, Monday afternoon, June 4.

JUNE 4-8: X-ray Diffraction School, North American Philips Co., Inc., Hotel Morrison, Chicago.

JUNE 17-22: Annual Meeting, American Society for Testing Materials, Chalfonte-Haddon Hall, Atlantic City, N. J.

JUNE 25-29: Annual Meeting, American Society for Engineering Education, Iowa State College, Ames.

JUNE 27-29: Summer Meeting, Compressed Gas Association, Seaview Country Club, Absecon, N. J.

SEPT. 20-21: Eastern Zone Meeting, National Welding Supply Association, Hotel Statler, New York City.

SEPT. 24-25: Central Zone Meeting, National Welding Supply Association, Hotel La Salle, Chicago.

SEPT. 24-28: X-ray Diffraction School, North American Philips Co., Inc., Sir Francis Drake Hotel, San Francisco.

SEPT. 24-28: Trade Fair of Atomic Industry, Atomic Industrial Forum, Inc., Navy Pier, Chicago.

SEPT. 25-27: Third Annual Atomic Industrial Forum Conference, "Management & Technology for Atomic Industry," in conjunction with Trade Fair, Morrision Hotel, Chicago.

OCT. 8-12: National Fall Technical Meeting, American Welding Society, Cleveland.

OCT. 8-12: Thirty-eighth National Metal Exposition and Congress, Cleveland Public Auditorium, Cleveland.

OCT. 22-26: National Safety Congress and Exposition, Chicago.

OCT. 29-30: West Central Zone Meeting, National Welding Supply Association, Hotel Nicollet, Minneapolis.

NOV. 1-2: Western Zone Meeting, National Welding Supply Association, St. Francis Hotel, San Francisco.

DEC. 3-4: Southeastern Zone Meeting, National Welding Supply Association, Dinkler-Tutwiler Hotel, Birmingham, Ala.

DEC. 6-7: Southwestern Zone Meeting, National Welding Supply Association, Statler-Hilton Hotel, Dallas.

RW new orders continue high

The monthly statistical report compiled by the Resistance Welder Manufacturers' Association, Philadelphia, again indicates substantial increases in orders for March.

For the third consecutive month, new orders have exceeded $5,500,000. New business for the first three months of this year, compared with the same period for last year, shows a gain of 116%.

Shipments during the same three months reflect an increase of 24% over the first quarter of 1955. The nearly $4,000,000 in shipments for March represents a record volume. Backlog of orders on hand at the end of March exceeds $20,000,000, according to the association.

Webster DIRECT READING
HYDRAULIC TYPE
FORCE GAUGES

Measures electrode pressure on spot welders and roll welders. Makes compressive tests on forming, dimpling and upsetting operations. Also useful for weighing. Insulated contact surface prevents damage if welder is accidently fired. Easy setups, no delicate mechanisms, 5 ranges: 0-1000, 6000, 10,000, 20,000, 40,000 lbs. 3½" diameter gauge with accuracy to 1%. Reads directly in pounds—no conversion scales. Write for details.

Webster
INSTRUMENT, INC.
Dept. W—11856 Mississippi Ave.
Los Angeles 25, California

AT THE FRONTIERS OF PROGRESS YOU'LL FIND

AN AIR REDUCTION PRODUCT

FOR WELDING AND CUTTING...

IN THE RED DRUM

HIGHEST QUALITY

DUST-FREE

NATIONAL CARBIDE

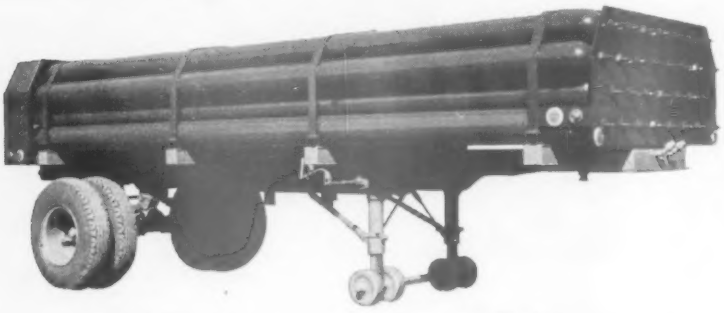
Write for the name and address of the NATIONAL CARBIDE supplier nearest you.

National Carbide Company
GENERAL OFFICES: 60 EAST 42ND STREET, NEW YORK 17, N. Y.
A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED

REDUCE CYLINDER HANDLING up to 50%

with INDEPENDENT *Gas Supply TRAILERS*

TRANSPORTING — Argon — Carbon Dioxide — Helium — Nitrogen — Oxygen — Boron Trifluroide — Hydrogen — Ethylene. Trailer capacities from 187,000 cu. in. to 750,000 cu. in. water capacity. Trailer tubes ICC3A-2400 Specifications with 2400 PSIG Working Pressure.



Sizes and weights to meet all State requirements.

Can be mounted on bases for permanent storage.

INDEPENDENT ENGINEERING CO., Inc.

CONSULTING · DESIGNING · RESEARCH

O'FALLON 5, ILLINOIS

FOR BEST RESULTS USE

Silvaloy

Silver Brazing Alloy preforms for Production Brazing. Rings, Stamped or Coined Washers and Wire Forms

All inquiries given immediate attention and shipments made on short notice. Technical service men are available to assist you in proper joint design. Silvaloy brazing alloys also available in wire, strip, and powder from stocks in six branch warehouses.

1200 FLUX

Use when silver brazing Brass, Bronze, Copper, Nickel-Silver, Steel, Stainless Steel, Monel, Nickel, Inconel and other Nickel alloys. Furnished in ½ lb., 1 lb., 5 lb., 30 lb., and 65 lb. containers.

STEEL SALES

3348 S. PULASKI ROAD • CHICAGO 23, ILLINOIS

PLANTS: DETROIT, ST. LOUIS, MILWAUKEE, MINNEAPOLIS, INDIANAPOLIS

OFFICES: KANSAS CITY, GRAND RAPIDS

Success attends West Coast show

The Santa Clara Valley welding show and clinic, reportedly first of its kind in the San Francisco Bay region, proved a success recently, with more than 1,700 persons viewing the latest in welding equipment, materials and processes.

More than 60 firms were represented in displays and demonstrations of equipment and processes, including samples of small welded products, jigs and fixtures. A feature was a photographic display of welded products and procedures.

Held in the new engineering building of San Jose State College, San Jose, Calif., the show enabled visitors to examine the modern facilities and engineering equipment used to train future engineers.

Joint sponsors of the welding event were the Santa Clara Valley Section of the American Welding Society and the engineering department of San Jose State College. Chairman of the organization committee was Ray L. Townsend, Tweco Products Inc., a director-at-large of the AWS.

Attendance at the show, drawing visitors from many parts of the country, demonstrated the ever-increasing interest in welding and its associated fields. Plans are under way, it is reported, to make the Santa Clara Valley welding show and clinic a yearly event.

Norelco sponsors X-ray school

The 24th X-ray diffraction school, sponsored by the Instruments Division, North American Philips Co., Inc., Mount Vernon, N. Y., will meet June 4-8 at the Hotel Morrison, Chicago. More than 100 scientists are reported to have registered for the sessions which will include demonstrations, lectures and question-and-answer periods.

Distributor appointments

Carboloy Department, General Electric Co., Detroit: Big Sandy Electric & Supply Co., Inc., Pikeville, Ky.

Hobart Bros. Co., Troy, Ohio: J. W. Goodliffe & Son, Allentown, Pa.; Arundel Sales & Service Co., Baltimore, Md.

Nelson Stud Welding Division, Gregory Industries, Inc., Lorain, Ohio: Tulsa Welding Supply Co., Tulsa, Okla.

Norton Co., Worcester, Mass. Gulf Terrazzo Supply Co., St. Petersburg, Fla.

Kenneth V. Lutz, general sales manager, has been elected vice-president in charge of sales by All-State Welding Alloys Co., Inc., White Plains, N. Y. He was formerly general field manager for All-State and regional manager in 11 western states and Hawaii. He is a member of the American Welding Society.

Francis H. Wemple, treasurer of Handy & Harman, has been elected a director. He joined Handy & Harman in 1945, serving first as assistant secretary, becoming treasurer in 1954.

John G. Seiler has been elected president of Tube Turns, Louisville, Ky., a division of National Cylinder Gas Co., Chicago. He succeeds *George O. Boomer*, who has retired as president of Tube Turns and the Girdler Co., both owned by National Cylinder Gas. *W. Roberts Wood* succeeds Mr. Boomer as president of Girdler. Mr. Boomer continues as chairman of the executive committee of National Cylinder Gas Co. Joining Tube Turns in 1930, Mr. Seiler was appointed sales manager in 1931. He was later elected vice-president and then named general sales manager in 1945. He was named vice-president of National Cylinder Gas Co. when elected to the presidency of Tube Turns. Mr. Seiler is a member of the American Welding Society, International Acetylene Association, American Standards Association and American Society for Metals.

Seiler

Martin Victor has been elected secretary of The Babcock & Wilcox Co., New York City. He previously had been executive assistant.

Carlton E. Dennis has joined Heckethorn Mfg. & Supply Co., Littleton, Colo., as its Chicago district promotional manager. He was formerly associated with Sellstrom Mfg. Co. for a period of 17 years.

NOW... make your own

• WATERPROOF
• SHOCKPROOF • NEOPRENE INSULATED

CABLE CONNECTORS

Now, for the first time, a 110-volt portable molding kit that anyone can operate, to seal cable connectors in waterproof, shockproof, neoprene insulated sleeves . . . in the plant . . . in the field . . . in minutes!

Tapered sleeve connection assures a waterproof joint when connector is locked. Low cost . . . rugged . . . simple . . . economical . . . factory and field test proven.

New kit, with its heavy-duty crimping and vulcanizing press plus 4 parts, are all you need. Eliminates soldering, short circuits, flexing and breaking of cable strands, down-time, wear, breakage and corrosion. Connectors employ a positive lock for high conductivity yet can be taken apart instantly.

Get the facts today on this revolutionary new product. Write for Catalog No. 131, or ask your welding supply distributor.

cam-lok DIVISION
EMPIRE PRODUCTS, INC., P.O. Box N-98, Cincinnati 36, Ohio

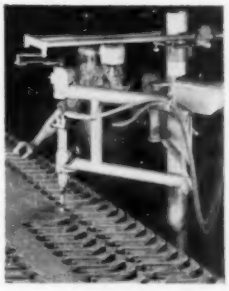
New HEATH
Precision Cutting Tool
Oxygen cutting 5 to 7 times faster than hand torch cutting

Replaces many punching, shaping, machining and drilling operations.

The Heath Ultra-Graph uses templates made from easily cut lightweight steel; magnetic tracer arm automatically holds true tolerances for repetitive production. Duplicates intricate flat shapes, cuts slots in pipe, tubing, round bars.

- Surface finishes are as smooth as 170 micro inches.
- Cuts 1/8" to 16" thick stock.*
- Cuts circles from 1/2" to 72" dia.; straight lines to 144".*

*depending on model



Ultra-Graphs Simplicity results in PRECISION and LOW COST
Sizes from $350 to $1000 fob factory.

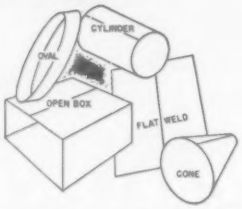
WRITE FOR NEW FOLDER
Heath ENGINEERING CO.
152 Ault Road, Fort Collins, Colo.
DISTRIBUTORS IN PRINCIPAL CITIES

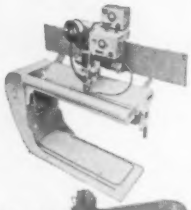
AIRLINE'S "KNOW-HOW" AT YOUR DISPOSAL

THESE TWO FIXTURES CAN GIVE YOU ACCURATE — SMOOTH — PRESSURE TIGHT Fusion Butt Welds

If you make these →

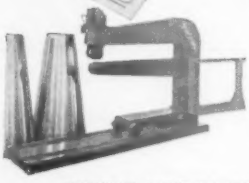
You need these →





AIRLINE MODEL LW SERIES 1000
Longitudinal Welding Fixture

Manufactured in 2 ft. to 12 ft. lengths. "Toe touch" control permits controlling fingers from any position. Welds sheets, cones, cylinders, boxes, etc., from .010 to one inch thickness. Suitable for MIG, TIG, submerged-arc and hand welds. Available also as complete package.



AIRLINE MODEL R 4000
Planishing Roll—60 Inch Throat

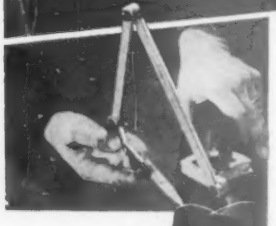
High Roller Face Pressure. Cold works welds and adjacent areas, flattens and smooths fushion welds, increases mechanical properties, reduces grinding. Also flattens flash welds, mash welds, resistance welds and elongated weld areas. Diameters 1¾ in. to 10 ft., and to 10 ft. lengths on large diameters.

WRITE TODAY FOR COMPLETE DATA AND SAMPLES

AIRLINE WELDING and ENGINEERING

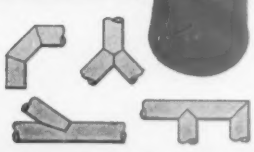
785 N. PRAIRIE, HAWTHORNE, CALIF., ORegon 8-5112 - OSborne 5-2225

LAY OUT PIPE JOINTS
in minutes!



SAVE TIME AND MONEY!

A SMOOTH SWING of the Contour Marker's soapstone point and you're ready to cut! It's easy and *absolutely accurate* because there is an angle dial calibrated in both degrees and pitch. Any of the pipe joint angles shown can be marked off in minutes. And you save "man hours" as well as oxygen and acetylene gas because "cut and try" methods are completely eliminated. Two sizes are available complete with adapter for marking structural steel. Standard, for pipes from 1½" to 18" dia.; Jumbo, for pipes from 16" to 48" dia. Instruction book included. Belt case available. Write for information



CONTOUR MARKER CORPORATION OF CALIFORNIA
1843 E. Compton Blvd., Compton, California • NEwmark 1-9474

THE CONTOUR MARKER

(Left to right) Singleton, Hopkins, Barr, Piraino, Gregory

The following changes have been made in the executive staff of Gregory Industries, Inc., Toledo, Ohio: *Leonard C. Barr* has been named vice-president and director of operations. He will be responsible for coordinating the company's engineering, manufacturing, and sales activities. He has been associated with Nelson Stud Welding since 1943, becoming vice-president in charge of sales in 1948. *Maurice A. Enright* has been named vice-president and director of planning, with responsibility for planning new facilities and for all personnel planning and administration. He was formerly vice-president in charge of manufacturing. *Robert J. Kilmer* has been elected financial vice-president and treasurer; he had been controller. *George E. Gregory, Jr.*, has been named controller. *Thomas A. Piraino,* previously administrative assistant to Mr. Barr, has been elected secretary of the company and has also been named manager of administrative services. *Horace S. Maynard* has been appointed vice-president; he was formerly secretary-treasurer. *Robert C. Singleton,* who joined the company in 1944 and has been manager of industrial sales, has been named vice-president in charge of engineering. *Gene P. Hopkins* succeeds Mr. Enright as vice-president in charge of manufacturing. He was previously general works manager.

H. C. Mathey has been promoted to vice-president in charge of sales of The Liquid Carbonic Corp., Chicago. Mr. Mathey has been with Liquid Carbonic for 30 years. He was previously vice-president in charge of Pacific Coast operations.

Grant S. Wilcox has been named plant manager of the Ross Operating Valve Co.'s plant, Detroit.

Carl Joseph Murray has been appointed works manager of the Buffalo, N. Y., plant of The Colorado Fuel and Iron Corp.'s Wickwire Spencer Steel Division.

Frank Brandt has been appointed representative in New England by Precision Welder & Flexopress Corp., Cincinnati, Ohio. He will be assisted in Connecticut by *Robert E. Browne.* Mr. Brandt, who will headquarter in Saugus, Mass., was chief electrical engineer and sales manager for 15 years for Thomson Electric Welder Co. Past chairman and director of the Boston section of the American Welding Society, he has served on numerous national committees of the AWS. He has been active in the Welding Research Council sub-committee, electric welding committee of the American Institute of Electrical Engineers, and Resistance Welder Manufacturers Association technical committees.

Brandt

Malvern J. Gross has been appointed vice-president of Tracerlab Inc., Boston, and general manager of the Keleket X-ray division of the company. As general manager of Keleket he will be responsible for engineering, development and marketing of X-ray products and sales operations of the division. Mr. Gross began his business career in General Electric Co.'s research laboratory, specializing in X-ray development. He was a member of a special mission for the U. S. Foreign Economic Administration, evaluating German developments in X-ray equipment during World War II. Most recently he was director of engineering for the Ritter Co.

Dick Bratt has been appointed salesman by Machinery & Welder Corp., Chicago welding supply distributor. He has been associated with the welding department of Keystone Steel & Wire Co., Hagerty Bros. Co., a steel warehouse and mill supplier, Stran Steel Products Co., and most recently with Towmotor Corp.

Bratt

Robert G. Keller has been named chief engineer of the machine division, Lewis Welding & Engineering Corp., Cleveland. His duties will include design and development of special machinery and automation equipment.

How light should a gas cylinder be?

HARRISBURG Cylinders are made with an eye to the future and their ability to pass successive quinquennial tests.

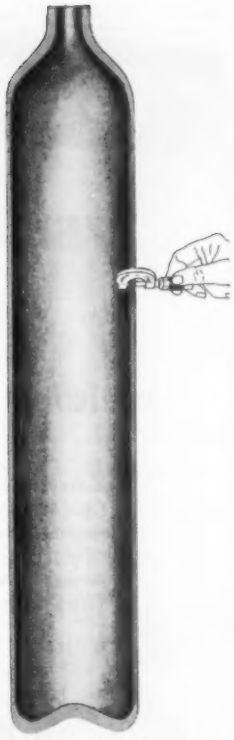
They are as light as is consistent with *well-balanced design and construction.* Their most important characteristic is their unequalled uniformity of wall thickness. This unusual regularity effects an even distribution of strength throughout. There is not a weak point in a HARRISBURG Cylinder, no spot too thin or too thick.

For the sake of safety and long service life, buy HARRISBURG Gas Cylinders.

More than a century in Harrisburg

Harrisburg Steel Co.

Division of Harsco Corporation — Harrisburg 8 Pennsylvania



Due to uniformity of wall thickness there is no excess weight in a HARRISBURG Cylinder.

restore worn teeth TO FULL SIZE FASTER

MANGANAL

T. M. Reg. U. S. Pat. Off.

CAST 11%-14% MANGANESE STEEL

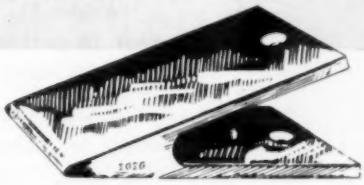
WING-DING

INDIVIDUAL SLIP-OVERS

1. WORN TOOTH

2. TRIM WITH TORCH

3. SELECT WING-DING



4. WELD AROUND EDGES

- Minimize welding time.
- Plug welds through holes give extra strength.
- Sizes available to fit every worn tooth.
- Easily attached with MANGANAL FLO-KOTE, SPECIAL TITE-KOTE or BARE welding electrodes.

Write for complete, "easy-to-do-it" details.

STULZ-SICKLES CO.

SOLE PRODUCERS 92 N. J. RAILROAD AVE. NEWARK, N. J.

NEAREST DISTRIBUTOR UPON REQUEST

BECKER

CARBON WELDER BRUSHES

for all types and makes of welding equipment

Everything you need from *one* source, with *one* responsibility. The fast, economical way to order. Catalog gives complete specifications, factory numbers, scaled drawings, etc. Write for your free copy today.

WHOLESALERS:
Some Distributorships still open.
Write for information.

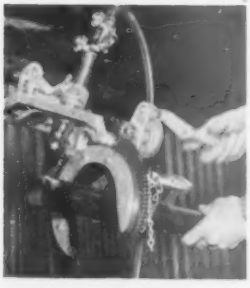
BECKER BROTHERS CARBON CO.
3450 SO. LARAMIE AVE • CICERO 50, ILLINOIS

H&M INTRODUCES A SENSATIONAL *FIRST!*

the MODEL "O"

a Pipe Beveler with a Cutting Range of

1½" to 4"



PAT. APPLIED FOR

★ PERFECT BEVELS AT MAXIMUM SPEED
★ COMPLETELY PORTABLE (Weight: 7½ lbs.)
★ EASY TO OPERATE
★ NO MORE HAND-CUTTING

Employing the same split-gear horseshoe principle as H&M's larger models, the Model "O" offers the maximum in speed and *quality of bevels* on small diameter pipe! Rugged and dependable, regardless of job conditions, H&M's Model "O" is easily operated by unskilled operators. Changing from one size pipe to another is a matter of seconds with precision-made adapters. *Get detailed information on the fast-selling Model "O" from your nearest dealer or the factory at once.*

H&M PIPE BEVELING MACHINE CO.

TRADEMARK REGISTERED

Tulsa, Okla.
311 East Third St. Diamond 3-0241

Titanium alloys

DEVELOPMENT OF IMPROVED TITANIUM-BASE ALLOYS. Published by Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C., 1956. 104 pages. Price $2.75. Available from the OTS, specify report PB 111988.

Evaluation of heat-treated properties of 24 alpha-beta titanium alloys is the aim of this research report for the Air Force prepared by scientists at Batelle Memorial Institute.

The principal alloying additions were manganese, molybdenum and vanadium. It was found that the strength-ductility relationships of alloys increased with increasing alloy content, up to about 7% alloy addition.

The Ti-3Mn-complex alloy had room-temperature properties slightly better than those of any other alloys tested. A Ti-5-Mn-2V alloy exhibited excellent elevated-temperature stability at 650 F.

A binary Ti-8V alloy was found capable of quenching from the beta-phase region and aging to give good properties. Most alloys are embrittled as a result of being heated into the beta-phase region.

The experimenters found that pickling to remove air-contaminated surface of alloy sheet added large amounts of hydrogen. A process was developed for descaling and pickling titanium-alloy sheet without appreciable hydrogen pickup. Using this process, the Ti-3Mn-complex alloy sheet was heat treated to 180,000 psi tensile strength, with over 10% elongation in 1 in.

Barrel finishing

HANDBOOK OF BARREL FINISHING. By Ralph F. Enyedy. Published by Reinhold Publishing Corp, New York City, 1956. 225 pages. Price $7.50.

Barrel finishing of metal and plastic parts is subject of this book. In step-by-step sequence, the text describes every phase of the process from cleaning and deslugging to coloring, polishing and burnishing.

More than 150 specifications sheets provide information for such finishing.

Make More Money on EVERY Welding Job . .

METAL BOND
SOLDERING AND WELDING
PRODUCTS

We have been making Metal Bond Products for more than 25 years and successful Welders all over the country have been using them to advantage.

AIDS TO GOOD WELDING JOBS

- Tinning Compounds • Soldering Salts • Hard Solder • Aluminum Solder • Mouldough • Brazing Flux No. 10 • Special No. 31 • Seal-X-O • Cast Iron Welding Flux No. 4 • All Steel Wire Brushes and Holders.
- Make your own test—also send for our pocket-size catalog which contains information and descriptions of our money-saving METAL BOND Products.

METAL BOND MFG. CO.
MONTGOMERY CITY, MO.
P.O. BOX 215

UNIQUE
POSITIONERS PRODUCE STRONGER, CLEANER BETTER WELDS

We build equipment to fit any and all applications.

UNIQUE EQUIPMENT, INC.
122 Sumpter St., Brooklyn 33, N. Y. C.

30 YEARS AGO

(Taken from *The Welding Engineer* of June, 1926)

Recently named local distributor for the Lincoln Electric Co., Cleveland, was Cleveland Tool & Supply Co., Cleveland. This marks the first time Lincoln has been represented in its home city.

—30 YEARS AGO—

Koro Electric Corp., Chicago, has been purchased by Lincoln Steel Co., of that city. Koro Electric is a manufacturer of welding electrodes.

—30 YEARS AGO—

J. W. Dunham, better known as Jimmie, the son of M. Keith Dunham of the Keith Dunham Co., Chicago, was graduated this month from Massachusetts Institute of Technology. He has joined his father's firm where his first duties will keep him busy at the acetylene cylinder plant in Milwaukee.

—30 YEARS AGO—

Dewey Maley has joined the staff of Central Steel & Wire Co., Chicago, as a demonstrator and salesman of welding electrodes and wire.

—30 YEARS AGO—

Stanley Winger of Standard Gas Products Co. recently was a visitor in Chicago.

—30 YEARS AGO—

F. W. Clifford of Victor Oxy-Acetylene Equipment Co., San Francisco, announced on his latest visit to Chicago that the firm has opened a new office in St. Louis, Mo. A. Henry has been named manager.

—30 YEARS AGO—

Glenn Forrester, who formerly operated a welding shop at Marion, Ind., has entered partnership with W. F. Gehle. They have opened a welding shop in Niles, Mich.

—30 YEARS AGO—

J. M. Harkins has been appointed district manager in the Virginia district by Air Reduction Sales Co., New York City. He will headquarter at Richmond.

—30 YEARS AGO—

Kansas Acetylene Gas Co., Wichita, Kansas, plans to start manufacture of acetylene gas for industrial plants in the near future. The firm has just constructed two warehouses and a plant.

TIG WELDING
Made Easy With
"Visuweld" Torches

VISUWELD torches improve and simplify tig welding by giving faster and better welds with less effort and minimum torch maintenance.

- The lightest and smallest 350 amp TIG welding torch with super maneuverability.
- Only TIG torch made with standard size transparent cup that guarantees absolute welding visibility.
- NO SPARE PARTS NECESSARY. No gaskets or parts to 'screw together'.
- VISUWELD contained unit torch head guarantees no water or gas leakage, and the coolest TIG welding torch ever designed.

Perfect welds at welding ranges from 3 to 350 Amps eliminates the need for 'standby' torches. VISUWELD torches are 3 torches in 1.

TEC TORCH CO., Inc.
300 Paterson Ave. Carlstadt, N. J.

BUY
SELL
USE

SHAWINIGAN CARBIDE

SHAWINIGAN PRODUCTS CORPORATION
EMPIRE STATE BUILDING
NEW YORK 1, N. Y.

free literature ..... USE CARD ON OPPOSITE PAGE

51. IGNITRONS — Amperex Electronic Corp. "The Facts of Life" is a 4-page booklet which, in question and answer form, discusses the construction and uses of available ignitrons.

52. STEEL PIPE, TUBING—The Babcock & Wilcox Co. Technical Data Card 163A contains properties and description of steel tubing and pipe for high temperature service.

53. SEAM WELDERS—The Taylor-Winfield Corp. Catalog 6-002 illustrates and describes OS type seam welders for industrial applications.

54. WELDING ACCESSORIES — The Fibre-Metal Products Co. 48-page comprehensive catalog covers welding helmets, electrode holders, face and hand shields, goggles, cable, weld testing machine, with a section on safety equipment.

55. BRAZING JIG—Technion Design & Mfg. Co. Brazing jig questionnaire when properly completed enables analysis of brazing jig problems.

56. GRINDING WHEELS — Grinding Wheel Institute. 34-page handy booklet "Mounted Wheels" details safe and efficient operation, with tables, of maximum operating speeds.

57. CABLES—General Cable Corp. Catalog sheet (A16-55) discusses rubber and neoprene welding cables.

58. RADIOGRAPHY — Balteau Electric Corp. Illustrated catalog sheets describe models "Baltograph 180 Panoram-X" and "Baltograph 260" industrial X-ray units.

59. LIFTING CLAMPS—J. C. Renfroe & Sons, Inc. 11-page catalog graphically presents models of "Safety Snap Lock" steel lifting clamps.

60. POSITIONERS — James Campbell Smith, Inc. Collection of illustrated catalog sheets discuss the construction and uses of "Gonser" portable positioners.

61. ELECTRIC TOOLS—Thor Power Tool Co. 44-page two-color catalog presents complete line of electric tools, including wrenches, saws, grinders, with parts and accessories.

62. WELDOR'S PLATE CLAMP—Portomag, Inc. Illustrated 4-page folder describes electro-magnetic plate clamp. Single and dual leverage adapters are for use in welding stiffeners to plate steel.

63. RW WELDERS—Precision Welder & Flexopress Corp. 6-page bulletin G-100 covers complete line of resistance welders, including special models for unusual production problems.

64. POWER TRANSMISSION—Worthington Corp. Bulletin V-1400-B20-P discusses and illustrates V-belts for industrial usage, including light machinery drives.

65. WELDING CONTROL—Ebert Electronics Corp. Illustrated bulletin gives technical data and description of midget "Minirelay" mercury plunger relay for use in welding control.

66. INDUCTION HEATING—Induction Heating Corp. Case histories of induction hardening are presented in *Induction Heating News* (No. IHN-3), as gear teeth in welded segments, preheating for stud welding and a question and answer clinic on heat-treating problems.

67. WELDED YACHT — Air Reduction Sales Co. 12-page reprint discusses the building of an all-welded 96-ft motor yacht. Structural design, construction features, prefabrication, shell plate and superstructure erection and welding are included.

68. COMPRESSED AIR—Hankison Corp. 6-page booklet describes the workings of a typical plant compressed air system, explains how moisture vapor in compressed air may be eliminated through dew point and explains dew point, relative humidity and saturation point.

69. SOLENOID VALVES — Automatic Switch Co. Bulletin V5006 describes in detail a 1-in. size, two-way solenoid valve constructed to handle corrosive fluids and gases. Bulletin V5004 describes larger size, general purpose solenoid valves.

70. BRAZING—Coast Metals, Inc. 4-page pamphlet is reprint of article discussing brazing of joints with nickel-base alloys and the good properties exhibited by such joints.

71. WELDOR'S LENS—The Magna Industrial Lens Co. Illustrated sheet describes prescription ground lens "Magna-Lens" for use in weldor's helmet.

72. FLAME MACHINING—Seaman-Andwall Corp. Booklet explains and illustrates in 7 pages "Cogmatic" precision flame machining for gears and sprockets.

73. CABLE SPLICER—Mine Safety Appliances Co. Pictorial sheet (Bulletin No. 1401-5) treats splicing with "MSA" velocity power cable splicer.

74. METAL COATING—The Wilbur & Williams Co. Sheet (65-2-ES-CFP) treats "Totrust Metal-Bond" clear metal protective coating. Liquid coating also acts as adhesive.

75. WELDERS — Brennen, Bucci & Weber, Inc. 4-page folder describes and illustrates "BrenWeld" arc welder, portable band saw blade welder, as well as lever-type drawbar and collets.

76. POSITIONERS—Aronson Machine Co. 38-page catalog B discusses, with illustrations, the construction and uses of varieties of positioners and turning rolls.

77. PRODUCTION OVENS — Despatch Oven Co. Bulletin 100 is color illustrated brochure describing gas and electric-fired production ovens, including applications, capacities, controls and specifications.

78. FORCE GAGE—Webster Instrument Inc. Descriptive literature treats force gage, hydraulic type, for measuring force between electrodes on spot welders and in forming, upsetting, dimpling.

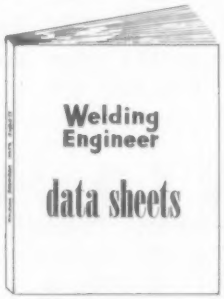
79. INSULATION — Johns-Manville. 20-page catalog covers insulation for high temperature usage.

80. OXYGEN, ACETYLENE — Superior Air Products Co. 20-page catalog illustrates and describes production of oxygen, nitrogen, acetylene in gaseous or liquid form.

81. WELDING DATA—Linde Air Products Co. Variety of welding case histories, including repair, are illustrated and described in Vol. 7, No. 2 of *Linde Metalworking Bulletin*.

Fingertip Control

. . . of welding information to help you is here in . . .



This cross-indexed volume contains 116 of the best Data Sheets appearing in WELDING ENGINEER in the past 15 years. Yet it costs only $1.40!

See your welding supply distributor or order from:

Welding Engineer
12 E. Grand Ave.
Chicago 11, Ill.

WHERE TO BUY

6714 Bryn Mawr Ave.

CLASSIFIED THE WELDING SHOPPER ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE

(Not available for equipment advertising)
90c a line, minimum 3 lines. To figure advance payment, count 5 average words as a line.
INDIVIDUAL EMPLOYMENT WANTED advertising rate is ½ the above rates, payable in advance.
PROPOSALS, 90c a line an insertion.

INFORMATION

BOX NUMBERS count 1 line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED RATE

The advertising rate is $8.75 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. W.E.

REPLIES (Box No.): Address to office at 12 E. Grand Ave., Chicago 11, Ill.

SCHOOL

WELDING—A profitable trade. Demand for trained men. Learn quickly at best equipped school in U. S. Non-profit. G. I. approved. Catalog free. Write: Hobart Welding School, Box U-661, Troy, Ohio.

POSITION WANTED

CONSULTANT—SUPERVISION. 35 years experience in production, supervision and training in all phases of welding. Seeking position requiring such talents. For details write Box No. 677, Welding Engineer, 12 E. Grand Ave., Chicago 11, Ill.

SALESMAN AND SALES ENGINEER . . . If you have a position of challenge open and you want a hi-caliber man of experience who has sold and demonstrated both electric and acetylene welding equipment, and welding alloys to distributors, industrial sales, and retail with proven sales record, with two years technical training. Good contacts in Chicago metropolitan area. Will relocate for a good opportunity. Available now. Member American Welding Society. No chiselers, please. Reply Box No. 678, Welding Engineer, 12 E. Grand Ave., Chicago 11, Ill.

HELP WANTED

Salesmen for Positioners, Turning rolls, Manipulators, progressive firm, good income. Write Box 679, Welding Engineer, 11 E. Grand Ave., Chicago 11, Ill.

SALESMAN
WELDING - SUPPLIES

Excellent position available for a salesman experienced in selling complete line of welding equipment, supplies and gases. Travel north side of Chicago only. Liberal salary and commission plus car allowance. We are a national organization and can provide opportunity for advancement.

THE LIQUID CARBONIC CORPORATION
3100 South Kedzie Avenue
Chicago 23, Illinois

BOOKS

WELDING BOOK BARGAINS
½ PRICE SALE
WELDING DESIGN HANDBOOK, formerly $2.00 now $1. Paper cover, 8½ x 11 in., 84 pages.
WELDING—ITS QUESTIONS AND ANSWERS, was $1.50 now 75c. Cloth cover, 5 x 8¼ in., 176 pages.
No charges or C.O.D.—cash with order postpaid.
WELDING ENGINEER
12 E. Grand Ave., Chicago 11, Ill.

SERVICES

SAVE YOUR OLD CUTTING TIPS

Send us your worn-out Oxygen-acetylene or propane cutting tips—For a fraction of the cost of a new tip, we'll make those "Worn-Out" tips **GOOD AS NEW.**
Each tip will be Reseated, Redrilled, Refinished and flame tested . . . then returned to you—Ready to give you the same service as a new tip.
Your cost for this service: Only $1.25 ea. Over 100 at $1.00 ea. Terms: 2% 10 days.
We condition tips of any style or make.
Send us a trial batch today—Satisfaction GUARANTEED.

AMEROTIP COMPANY
1811 Taylor St., Dept. C Columbia, S. C.

WANTED TO BUY

WANTED TO BUY—Hydraulic press for Electrodes 100 tons up. New or in good working condition. Reply to Box No. 676, c/o Welding Engineer, 12 E. Grand Ave., Chicago 11, Ill.

BUSINESS OPPORTUNITIES

A NICE REPEAT BUSINESS
JOBBERS WANTED IN EVERY CITY TO SELL "WELDER'S PAL" EYE DROPS
On the market for 20 years
CARHOFF COMPANY
11706 Kinsman Rd., Cleveland 20, Ohio

FOR SALE—NORTHERN NEW JERSEY WELDING SUPPLY BUSINESS
One man operation—will yield better than $20,000.00 a year personal income—after expenses . . . Established 12 years . . . Owner retiring.
Several hundred customers, several hundred cylinders—plus stock, truck included—Reasonable Price—ONLY $19,000.00—Easy Mortgage.
WRITE Box No. 675, c/o Welding Engineer, 12 E. Grand Ave., Chicago 11, Ill.

EQUIPMENT FOR SALE

IN 100-LB. LOTS, F.O.B. SCRANTON
SALE OF SURPLUS ELECTRODES
AMPCO-TRODE, 3/16" x 14" No. 10 Aluminum Bronze Coated D.C. Electrodes in Good Condition—25 lb. Cartons—80c lb.
SCRANTON WELDING SUPPLY COMPANY
1301 Wyoming Ave. Scranton, Penna.

CUTTING MACHINES, AIRCO Camo & Radiagraphs.
SEAM WELDER, Progressive, 150 KVA, New.
SPOT WELDER, National, 40 KVA, Used.
CUTTING TORCHES, Used, Oxweld, Airco, Harris.
WELDING TORCHES, New, Rego GV.
BRONZE—STAINLESS—AMPCOTRODES.
NO. 12 LENSES, ELECTRODE HOLDERS.
RALL SUPPLY CO. 51 E. 42nd St., N.Y.C. 17

EQUIPMENT FOR SALE

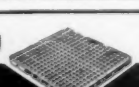
CUTTING TIPS
We have on hand Airco type Style 209 propane tips that we have reconditioned and will guarantee 100% to your satisfaction. $1.40 each in lots of 12 only. F.O.B., Chester, Pa.
AEROTIP COMPANY
2700 West 3rd St. Chester, Pa.

FOR SALE
Complete 50 Meter Oxygen
Plant with Liquid Oxygen
or Nitrogen Pump.
Norwalk 6x6 Acetylene Compressor.
Box No. 680, Welding Engineer
12 E. Grand Ave., Chicago 11, Ill.

SCIAKY MODEL PMC02-S-31 50KW 3/phase Resistance Welder, Serial No. 2150, complete with electronic controls, water-cooled induction tips.
PRICE: $1450.00

SCIAKY MODEL PMCR2-S-61 60KW 3/phase Resistance Welder, Serial No. 2349, complete with electronic controls, water-cooled induction tips.
PRICE: $1650.00

Both machines available
for imediate delivery
or for inspection in our warehouse.
UNITED MACHINERY & TOOL CORP.
Worcester 8, Massachusetts

Welding  **Platens**
Acorn Iron & Supply Co.
901 N. Delaware Ave. Phila. 23, Penna.

Literature offered in ads

125. Airline Welding & Engineering—Data and samples on fusion butt welds.

126. Air Reduction Sales Co.—Literature on oxyacetylene-shape cutting machines.

127. Air Reduction Sales Co.—Catalog 1318-WE, "Airco Electrode Guide," to help you select the right electrode for your specific job.

128. Air Reduction Sales Co.—Catalog 9-131-WE on rods and fluxes for joining ferrous and non-ferrous metals.

129. Alloy Rods Co.—Complete information on "Arcaloy" stainless steel electrodes.

130. All-State Welding Alloys Co., Inc.—"Buyers Guide" contains product solutions to metalworking problems.

131. Ampco Metal, Inc.—Information on "Ampco-Weld" resistance-welding products.

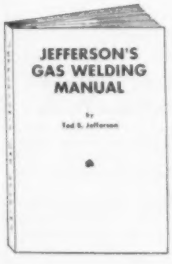
132. Anchor Metal Co., Inc.—Catalog and information on how to save money and do better joining with your complete line of solder products.

133. Arcair Co.—Complete information on new "L Model" automatic travel torch and "Case History Book."

134. Arcos Corp.—Details on low-hydrogen electrodes for welding low-alloy steels, and stainless electrodes.

JEFFERSON'S GAS WELDING MANUAL

by Ted B. Jefferson



- 7 Chapters
- 112 Pages
- 5 x 7½ in. Size
- 39 Tables
- 67 Illustrations
- Indexed
- Only $2

America's newest gas welding book and the only book with—

- Jiffy Welding Guides
- Jiffy Flame Cutting Guides
- Jiffy Joining Chart

Other chapters on How to Weld; How to avoid Defective Welds; Flame Cutting; Flame Treating and Useful data for the Welder.

Order from your

Welding Supply Distributor
or
Welding Engineer
12 E. Grand Ave., Chicago, Ill.

135. Atlas Welding Accessories Co.—Details on weld-cleaning tools and other accessories.

136. Becker Bros. Carbon Co.—Catalog on carbon welder brushes for all makes of welding equipment gives complete specifications, factory numbers, scaled drawings, etc.

137. Bernard Welding Equip. Co.—Bulletins SS-3, MP-6 and PCB-6 on electrode holders, mechanical hands and contour cleaners.

138. Cam-Lok Div.—Catalog 131 on making your own waterproof, shockproof and Neoprene-insulated cable connections.

139. Chicago Hardware Foundry Co.—Folder on welding fluxes.

140. Columbia Electric Mfg. Co.—Catalog WE-400 on the "Tong Test" a-c/d-c ammeter.

141. Contour Marker Corp.—Details on laying out pipe joints.

142. Drawalloy Corp.—Information on precision-drawn hardfacing and welding wire.

143. Eastman Kodak Co.—Details on new industrial "Type AA" X-ray film.

144. Eisler Engineering Co., Inc.—Information on resistance-welding and general welding equipment.

145. Erico Products Co.—Catalog on "Caddy Type B" electrode holders.

146. Essex Welding Equip. Co., Inc.—Details on Archer electrode ovens.

147. Fibre Metal Products Co.—Catalog 24 and Bulletin 39 cataloging safety equipment for working protection.

148. General Electric Co.—Information on three new power sources for automatic welding.

149. General Electric Co.—Information and Bulletin GEC-1334 regarding "Filler-arc" automatic gas-shielded welding.

150. H & M Pipe Beveling Machine Co.—Detailed information on "Model O" pipe beveler.

151. Harnischfeger Corp.—Information on "P & H" d-c welders.

152. Harnischfeger Corp.—Information on "P & H" iron-powder, low-hydrogen electrodes.

153. Harrisburg Steel Co.—Details on the light weight and well-balanced design and construction of gas cylinders.

154. Harris Calorific Co.—Information on automatic oxyacetylene torches.

155. Heath Engineering Co.—Folder on the "Ultra-Graph" precision cutting machine.

156. Hobart Bros. Co.—Complete details on the type of welder that you are most interested in.

157. Hobart Bros. Co.—Information on arc welding equipment and electrode samples for every kind of welding job.

158. Holger-Andreasen, Inc.—Information on "Andrex" portable X-ray for fast

(Continued on page 92)

AD INDEX

Airline Welding & Engineering 84
Air Reduction Sales Co. 12, 44, 63
Allen Co., L. B. 88
Alloy Rods Company 73
All-State Welding Alloys Co., Inc. 80
American Chain & Cable Co., Page Steel & Wire Div. 46-47
Ampco Metal, Inc. 57
Anchor Metal Co. 79
Arcair Company 54
Arcos Corporation 70-71
Atlas Welding Accessories Co. 19

Becker Bros. Carbon Co. 86
Bernard Welding Equip. Co. 72

Cam-Lok Div., Empire Products, Inc. 83
Chicago Hdwe. Foundry Co. 78
Columbia Electric Mfg. Co. 79
Contour Marker Corp. 84

Drawalloy Corp. 16

Eastman Kodak Co. 49
Eisler Engineering Co., Inc. 76
Erico Products, Inc. 2
Essex Welding Equip. Co., Inc. 63

Fibre-Metal Products Co. ..... Inside Front Cover

General Electric Co. 20, 21, 22

H & M Pipe Beveling Machine Co. 86
Harnischfeger Corp. 14, 62
Harrisburg Steel Corp. 85
Harris Calorific Co. 59
Heath Engineering Co. 83
Hobart Bros. Co. 1
Holger-Andreasen 69

Independent Engineering Co., Inc. 82
International Nickel Co., Inc. 9, 75

Jackson Products ..... Front Cover

K-G Equipment Co., Inc. 80

Lincoln Electric Co., The 24
Linde Air Products Co., A Div. of Union Carbide & Carbon Corp. 23

Mallory & Co., Inc., P. R. 13
Metal & Thermit Corp. 67
Metal Bond Mfg. Company 87
Miller Electric Mfg. Co. 10

National Carbide Co. 81
National Welding Equipment Co. 7
Norris-Thermador Corp. 43
Norton Company 11

Page Steel & Wire Div., American Chain & Cable Co. 46-47
Picker X-Ray Corp. 61
Precision Grinding Wheel Co. 77

Rankin Mfg. Co. 65
Reid-Avery Co. 45

Shawinigan Products Corp. 87
Smith, A. O. ..... 50-51, Back Cover
Steel Sales Co. 82
Stoody Company 53
Stulz-Sickles Co. 85

Tec Torch Co., Inc. 87
Tempil Corporation 76
Titanium Alloy Mfg. Co. 74
Tube Turns, Inc. 17-18
Tweco Products Co. ..... Inside Back Cover

Union Carbide & Carbon Corp., Linde Air Products Co. 23
Unique Equipment, Inc. 87
United Wire & Supply Co. 68

Vickers Electric Div., Vickers, Inc. 8
Victor Equipment Co. 4, 26
Vogel Tool & Die Corp. 78

Webster Instrument, Inc. 81
Worthington Corp. 55

WELDING INFO-AIDS

USE THIS CARD for Literature, Catalogs, and Bulletins shown on preceding pages and for those featured in this month's ads as listed opposite and on following page.

Also information about

NEW PRODUCTS described on pages 64 to 77

Every month WELDING ENGINEER lists many new catalogs and bulletins available from manufacturers. All are yours for the asking. However, this service is valuable to you only if you use it.

USE POSTPAID CARD →

★ For copies of any manufacturers' bulletins described on these pages, circle the number of the items on card at right. Fill in your name, title, company and address. This has to be done only once on either post card. You need no postage.

★ For additional information on New Products described in this issue, circle the numbers and the items that interest you. The New Products section begins on page 64.

WARNING!

Illegible or incomplete addresses may keep you from receiving the information you desire. And remember, cards, postmarked after the deadline date cannot be processed.

★ Post card not valid after three (3) months. After that time has elapsed, use your own letterhead to describe fully the information and/or literature wanted.

Name_____ Title_____

Company_____

Address_____

City_____ State_____ 6/56

NOT GOOD AFTER SEPTEMBER 1, 1956

WELDING ENGINEER, 12 East Grand Ave., Chicago 11, Ill.

Please send me without obligation further information about the following:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125
126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225
226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD
First Class Permit No. 45854, Chicago, Ill.

Welding Info-Aids,
Welding Engineer
12 East Grand Avenue
Chicago 11, Ill.

Literature offered in ads

(Continued from page 90)

non-destructive inspection of welded metal structures.

159. Independent Engr. Co., Inc.—Details on how to reduce cylinder handling with gas supply trailers.

160. International Nickel Co., Inc.—Folder, "Announcing Inco-Rod 'A'" on welding most dissimilar alloy joints.

161. International Nickel Co., Inc.—Write for Technical Bulletin T-2, "Fusion Welding of Nickel and High Nickel Alloys."

162. Jackson Products, Inc.—Details on fiber glass helmet and other new arc welding accessories.

163. K-C Equipment Co.—24-page catalog on cutting and welding torches.

164. Lincoln Electric Co.—Bulletin 1343 on "Idealarc" a-c/d-c welder.

165. Linde Air Products Co.—Illustrated literature on modern process of powder-cutting.

166. Mallory & Co., Inc., P. R.—Write for a personal consultation by a Mallory engineer on welding electrodes, holders, seam welding wheels, forgings and supplies.

167. Metal & Thermit Corp.—Information on "Murex" electrodes, machines and accessories.

168. Metal Bond Mfg. Co.—Catalog on soldering and welding products.

170. Miller Electric Mfg. Co., Inc.—Details on "Arcweld" welding electrodes and "SRH low-boy" d-c rectifier type welder.

171. National Carbide Co.—Write for name and address of nearest supplier.

172. National Welding Equip. Co.—Illustrated brochure on oxygen and acetylene equipment and accessories.

173. Norris-Thermador Corp. — Information and specifications on all sizes of acetylene cylinders.

174. Norton Co.—Data on reinforced "B-11" resinoid bonded wheels for weld grinding.

175. Page Steel & Wire Div.—Folder DH-402 sets forth analyses of automatic welding wire.

176. Picker X-Ray Corp.—Information for everything in radiography and fluoroscopy.

177. Precision Grinding Wheel Co., Inc.—Information on saucer-type grinding wheel.

178. Rankin Mfg. Co.—Further details on hardfacing electrodes and rods.

179. Reid-Avery Co., Inc.—Information on "120-16T" electrodes for welding T-1 steel plate and "Pay-Off-Pak" for automatic submerged-arc welding and inert-gas welding.

180. Shawinigan Products Corp.—Information on carbide.

181. Smith Corp., A. O.—Information on E6016 hydrogen electrodes.

182. Smith Corp., A. O.—Details on how "C-O manual" carbon-dioxide, hand-gun welding cuts time and gas costs and results in clean welds.

183. Steel Sales Co.—Details on "Silvaloy" silver-brazing performs for production brazing.

184. Stoody Co.—Complete information on automatic hardfacing installations and procedures.

185. Stulz-Sickles Co.—Complete "easy-to-do-it" details on how to restore worn teeth to full size faster with Manganal "Wing-Ding" individual slip-overs.

186. Tec Torch Co., Inc.—Leaflet on transparent cups for Tig torches.

187. Tempil Corp.—Information on, and sample pellets of, temperature indicators.

188. Titanium Alloy Mfg.—Information on "Ruflux" coatings for welding electrodes.

189. Tube Turns, Inc.—Send for booklet, "Pipe, Fitting and Flange Materials."

190. Tweco Products, Inc.—Catalog on complete line of arc-welding accessories and aluminum arc-welding cable.

191. Unique Equipment, Inc.—Data on custom-built equipment to fit any and all applications and details on how positioners produce stronger, cleaner, better welds.

192. United Wire & Supply Corp.—Fully-illustrated catalogs and price sheets on "Sil-Bond Phoson" brazing alloys.

193. Vickers Elec. Div.—Complete information and literature on "Controlarc" d-c welder and its items of versatility, such as low-spatter performance on special electrodes, etc.

194. Victor Equip. Co.—Illustrated hardfacing manual tells which alloys to use and how to apply.

195. Victor Equip. Co.—Descriptive Bulletin 353 on the fast-operating "VU-120" flame-cutting machine.

196. Vogel Tool & Die Corp.—Sample and information on twin-notched pipe or tubing.

197. Webster Instrument, Inc.—Details on direct-reading, hydraulic-type force gauges.

198. Worthington Corp.—Literature on packaged positioning equipment.

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

First Class Permit No. 45854, Chicago, Ill.

Welding Info-Aids,

Welding Engineer

12 East Grand Avenue

Chicago 11, Ill.

Name_____ Title_____

Company_____

Address_____

City_____ State_____ 6/56

NOT GOOD AFTER SEPTEMBER 1, 1956

WELDING ENGINEER, 12 East Grand Ave., Chicago 11, Ill.

Please send me without obligation further information about the following:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125
126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225
226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250

Imagine a holder weighing half as much as your helmet!

capacity
300 AMPS
ELECTRODES
1/4 - 1/16

TRY

MODEL AL-300

TWECOTONG

it weighs just 13½ ounces

Here is a holder that's made for the man who wants a lightweight holder for easier welding. Its lower body and upper lever are forged aluminum alloy . . . with current carrying capacity equal to the much heavier copper alloys. Like all TWECO electrode holders, TWECOTONG AL-300 has tips and body insulation of SUPER-MEL laminated glass cloth . . . the toughest, safest and longest lasting holder insulation made.

The upper and lower jaws of AL-300 TWECOTONG are quickly and easily replaceable, as are all other parts. The jaws hold the electrode with a vice-like grip so you know where it is at all times; yet they open easily to change rods. You can install this holder on the line in one minute flat. Just bare the cable end, insert it in the reamed hole in the holder body and tighten one cone shaped screw . . . that's all!

SEE YOUR LOCAL WELDING SUPPLY DISTRIBUTOR

Write for FREE Catalog picturing complete line of Arc Welding Accessories and TWECO-LITE Aluminum Arc Welding Cable.

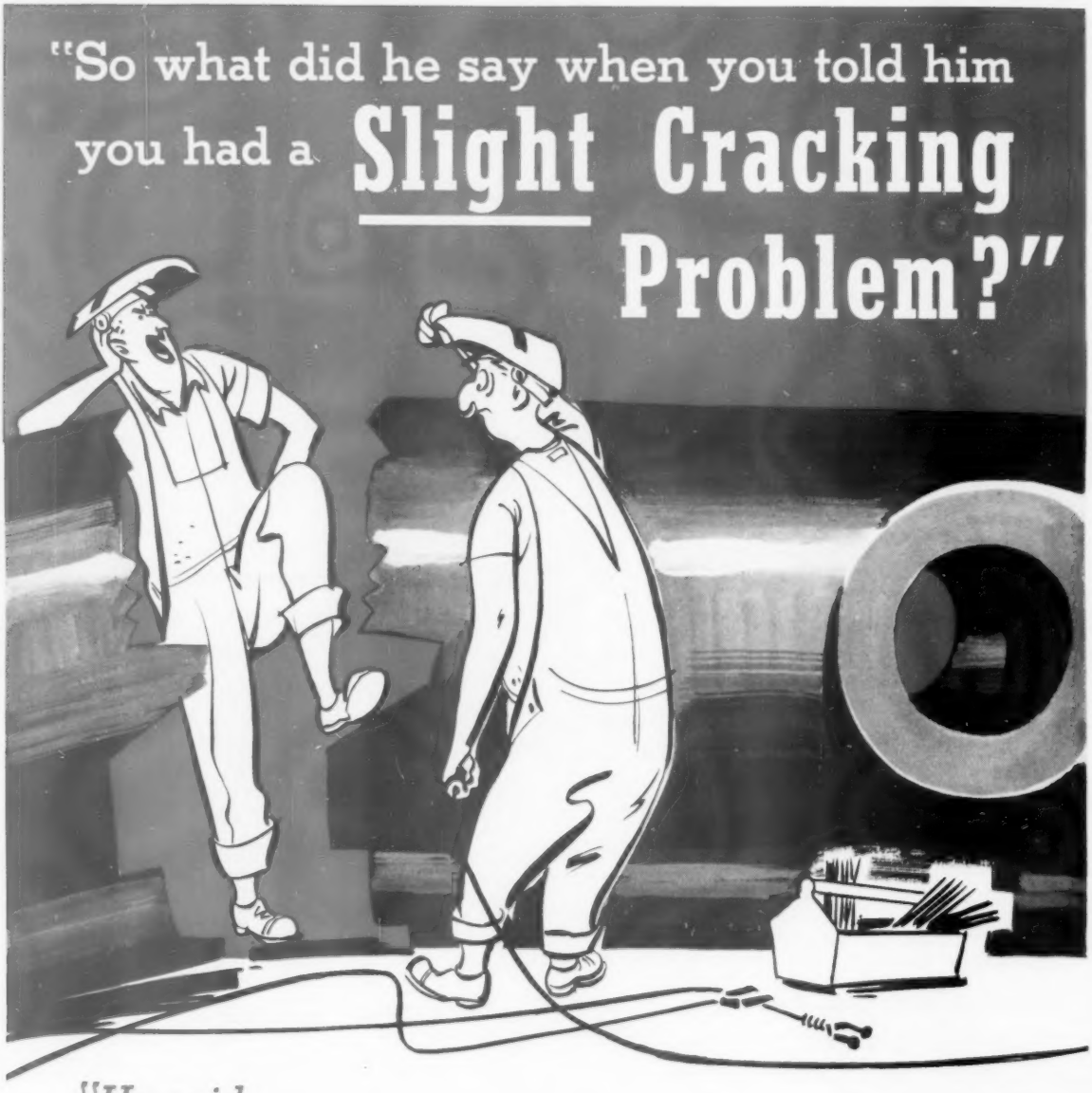
Tweco

MANUFACTURERS OF ELECTRODE HOLDERS • GROUND CLAMPS • CABLE CONNECTIONS FOR ELECTRIC WELDING

PRODUCTS, INC.

BOSTON AT MOSLEY • WICHITA, KANSAS, U.S.A.

"So what did he say when you told him you had a Slight Cracking Problem?"



"He said

See the chaplain or call the man from A. O. Smith."

"Gadzooks!" said the man from A. O. Smith. "This is just the job for our SW-65."

And sure enough, these E-6016 low hydrogen electrodes did the job. As in so many cases (real ones) SW-65's proved ideal for work on steels of poor weldability . . . jobs where cracking and porosity were a problem.

However, all welding problems aren't as simply solved. Many times, there's a question of techniques and procedures or machine selection.

That's why the man from A. O. Smith is the man to call when you're having troubles. He's a welding specialist himself, and if necessary, he can draw on the experience and research facilities of A. O. Smith—one of the world's largest users of welding on the production lines.

So why not toss him *your* problem? Let the man from A. O. Smith worry about it!

Through research A.O. Smith *. . . a better way*

A.O.Smith

CORPORATION

WELDING PRODUCTS DIVISION

Milwaukee 1, Wisconsin

INTERNATIONAL DIVISION: Milwaukee 1, Wis.